ORDER NO. MTNC020721C1
B5

Service Manual

Color Television

Main Manual
(NA9FL)

Panasonic

Models	Chassis
CT-32SX12F	**AP381**
CT-32SX12UF	**AP381**
CT-32SX12CF	**AP381**
CT-36SX12F	**AP382**
CT-36SX12UF	**AP382**
CT-36SX12CF	**AP382**

This Service manual is issued as a service guide for the models of the **NA9FL** family listed above. Included in this manual are a set of schematic, block diagrams, functional descriptions, alignment procedures, disassembly procedures and a complete parts list.

The service technician is required to read and follow the "**Safety Precautions**" and "**Important Safety Notice**" in this main manual.

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Important safety notice

Special components are used in this television set which are important for safety. These parts are identified on the schematic diagram by the symbol ⚠ and printed in **BOLD TYPE** on the replacement part list. It is essential that these critical parts are replaced with the manufacturer's specified replacement part to prevent x-ray radiation, shock, fire or other hazards. Do not modify the original design without the manufacturer's permission.

Safety precautions

General guidelines

An **isolation transformer** should always be used during the servicing of a receiver whose chassis is not isolated from AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks. It will also protect the receiver from being damaged by accidental shorting that may occur during servicing.

When servicing, observe the original lead dress, especially in the high voltage circuit. Replace all damaged parts (also parts that show signs of overheating.)

Always replace protective devices, such as fishpaper, isolation resistors and capacitors, and shields after servicing the receiver. Use only manufacturer's recommended rating for fuses, circuits breakers, etc.

High potentials are present when this receiver is operating. Operation of the receiver without the rear cover introduces danger for electrical shock. Servicing should not be performed by anyone who is not thoroughly familiar with the necessary precautions when servicing high-voltage equipment.

Extreme care should be practiced when **handling the picture tube**. Rough handling may cause it to implode due to atmospheric pressure. (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure. When handling, use safety goggles and heavy gloves for protection. **Discharge the picture tube** by shorting the anode to chassis ground (not to the cabinet or to other mounting hardware). When discharging connect cold ground (i.e. dag ground lead) to the anode with a well insulated wire or use a grounding probe.

Avoid prolonged exposure at close range to unshielded areas of the picture tube to prevent exposure to x-ray radiation.

The **test picture tube** used for servicing the chassis at the bench should incorporate safety glass and magnetic shielding. The safety glass provide shielding for the tube viewing area against x-ray radiation as well as implosion. The magnetic shield limits the x-ray radiation around the bell of the picture tube in addition to the restricting magnetic effects. When using a picture tube test jig for service, ensure that the jig is capable of handling **40kV** without causing x-ray radiation.

Before returning a serviced receiver to the owner, the service technician must thoroughly test the unit to ensure that is completely safe to operate. **Do not use a line isolation transformer when testing.**

Leakage current cold check

Unplug the AC cord and connect a jumper between the two plug prongs.

Measure the resistance between the jumpered AC plug and expose metallic parts such as screwheads, antenna terminals, control shafts, etc. If the exposed metallic part has a return path to the chassis, the reading should be between 240kΩ and 5.2MΩ. If the exposed metallic part does not have a return path to the chassis, the reading should be infinite.

Leakage current hot check (Fig. 1)

Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check.

Connect a 1.5kΩ 10 watt resistor in parallel with a 0.15μF capacitor between an exposed metallic part and ground. Use earth ground, for example a water pipe.

Using a DVM with a 1000 ohms/volt sensitivity or higher, measure the AC potential across the resistor.

Repeat the procedure and measure the voltage present with all other exposed metallic parts.

Verify that any potential does not exceed 0.75 volt RMS. A leakage current tester (such a Simpson model 229, Sencore model PR57 or equivalent) may be used in the above procedure, in which case any current measure must not exceed 0.5 milliamp. If any measurement is out of the specified limits, there is a possibility of a shock hazard and the receiver must be repaired and rechecked before it is returned to the customer.

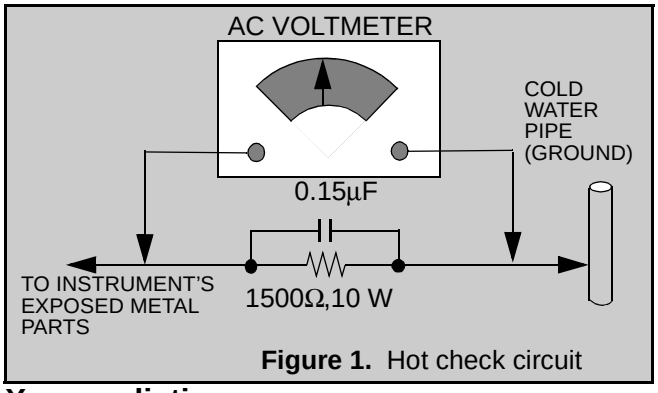


Figure 1. Hot check circuit

X-ray radiation

WARNING: The potential source of x-ray radiation in the TV set is in the high voltage section and the picture tube.

Note: *It is important to use an accurate, calibrated high voltage meter.*

Set the **brightness, picture, sharpness** and **color** controls to minimum. Measure the high voltage. The high voltage should be **31.0 ± 1.0kV**. If the upper limit is out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature component failure.

Horizontal oscillator disable circuit test

This test must be performed as a final check before the Receiver is returned to the customer. See horizontal **oscillator disable circuit procedure check** in this manual.

About lead free solder (PbF)

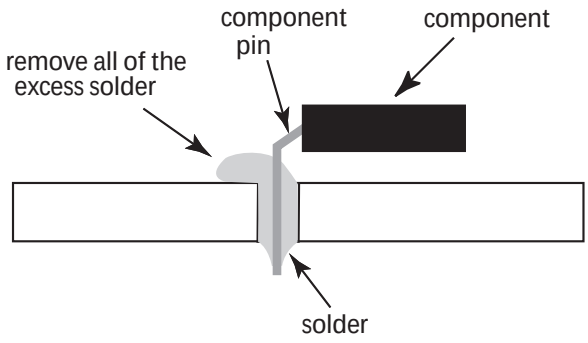
Note: Lead is listed as (Pb) in the periodic table of elements.
In the information below, Pb will refer to Lead solder, and PbF will refer to Lead Free Solder.
The Lead Free Solder used in our manufacturing process and discussed below is (Sn+Ag+Cu).
That is Tin (Sn), Silver (Ag) and (Cu) although other types are available.

This model uses Pb Free solder in it's manufacture due to environmental conservation issues. For service and repair work, we'd suggest the use of Pb free solder as well, although Pb solder may be used.

PCBs manufactured using lead free solder will have the "PbF" or a leaf symbol PbF stamped on the back of PCB.

Caution

- Pb free solder has a higher melting point than standard solder. Typically the melting point is 50 ~ 70 °F (30 ~ 40 °C) higher. Please use a high temperature soldering iron and set it to 700 ± 20 °F (370 ± 10 °C).
- Pb free solder will tend to splash when heated too high (about 1100 °F or 600 °C). If you must use Pb solder, please completely remove all of the Pb free solder on the pins or solder area before applying Pb solder. If this is not practical, be sure to heat the Pb free solder until it melts, before applying Pb solder.
- After applying PbF solder to double layered boards, please check the component side for excess solder which may flow onto the opposite side. (see figure below)



slice view

Suggested Pb free solder

There are several kinds of Pb free solder available for purchase. This product uses Sn+Ag+Cu (tin, silver, copper) solder. However, Sn+Cu (tin, copper), Sn+Zn+Bi (tin, zinc, bismuth) solder can also be used.

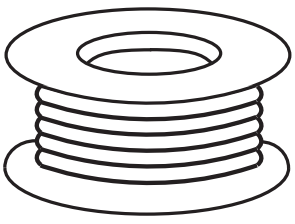
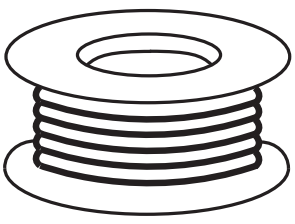
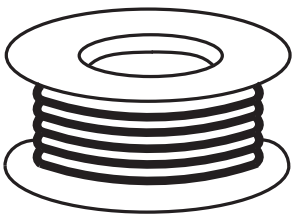
0.3mm X 100g	0.6mm X 100g	1.0mm X 100g
		

Table of Contents

Important safety notice 2

Safety precautions 2
General guidelines 2
Leakage current cold check 2
Leakage current hot check 2
X-ray radiation 2
Horizontal oscillator disable circuit test . . 2

Service notes 5

Leadless chip component (surface mount) 5
Component removal 5
Chip component installation 5
How to replace Flat IC 5
Horizontal oscillator disable circuit 6

SPECIFICATIONS

Receiver feature table 7

OPERATION

Location of controls (receiver) 9

Quick reference control operation 9

Location of controls (remote) 10

SERVICE

Disassembly for service 11

Back cover 11
A-Board 11
L-Board 11
Speakers 11
Keyboard push button assembly 11
Disassembly for CRT replacement 11
CRT replacement 11

Back cover removal 13

Chassis service adjustment procedures 14

140.0V B+ Voltage confirmation 14
Source voltage chart 14
High voltage check 14

Purity and convergence procedure 15

When the CRT or the yoke is replaced . 15
Vertical raster shift adjustment 15
Initial center static convergence 16
Purity adjustment 16
Final convergence procedure 16
Dynamic corvergence adjustment 16
DY(YHC, YV, XV) adjustment 16
YV Adjustment (VR1 for Horizontal dynamic convergence) . . 16
YH Adjustment (VR2 for vertical dynamic convergence) 17
XV Adjustment (precise adjustment) 17
Permalloy convergence corrector strip (part No. 0FMK014ZZ) 17
DAF adjustment 17

Service mode (electronic controls) 19

Quick entry to service mode 19
To toggle between aging and service modes 19
Exiting the service mode 19
To check colors 19
Entering service mode (open-back method) 19
To check purity 21
Instructional flow chart for service mode 22

Service adjustments (electronic controls) . . . 24

Sub-Contrast adjustment 24
Sub-Brightness (BRIGH) 24
Tint/Color adjustment 24
Tint/Color adjustment (No rainbow pattern) 25
Color temperature adjustment (B/W Tracking) 25
Complete adjustment 25
Horizontal centering (H-POS) 26
Horizontal width adjustment (H-WIDTH) 26
Horizontal trapezoid adjustment (HTRAP) 26
Parallelogram adjustment (R524) 26
East west PCC balance adjustment (SIDE) 26
Vertical linearity adjustment (V-C) 27
Vertical correction adjustment (V-S) . . . 27
Vertical size and vertical position adjustment (VEAMP & VRAS) 27
PCC adjustment (PCC) 27
Corner PCC adjustment (TOPG, TOPSL, BTMG, BTMSL) . . 27
MTS circuit adjustments 28
Input level adjustment (MTSIN) 28
Stereo separation adjustment (SEPAL & SEPAH) 28
Clock adjustment (CLOCK) 28
Service adjustments (mechanical controls) 28
Focus (part of T551) 28

CIRCUITS & BLOCK DIAGRAMS

Audio signal path block diagram 29

Video signal path block diagram 30

Description of connectors 31

Component identification 33

Parts list 36

FOLDOUTS

Schematics, voltages and waveforms

A-Board schematic 50
A-Board voltages 54
D-Board schematic 56
D-Board voltages 59
A-Board waveforms 60
G-Board schematic 62
G-L-Board voltages 65
L-Board schematic 66
A-Board pcb 68
D-Board pcb 70
G-Board pcb 72
L-Board pcb 74

Service notes

Note: ***These components are affixed with glue. Be careful not to break or damage any foil under the component or at the pins of the ICs when removing. Usually applying heat to the component for a short time while twisting with tweezers will break the component loose.***

Leadless chip component (surface mount)

Chip components must be replaced with identical chips due to critical foil track spacing. There are no holes in the board to mount standard transistors or diodes. Some chips capacitor or resistor board solder pads may have holes through the board, however the hole diameter limits standard resistor replacement to 1/8 watt. Standard capacitor may also be limited for the same reason. It is recommended that identical components be used.

Chip resistor have a three digit numerical resistance code - 1st and 2nd significant digits and a multiplier. Example: 162 = 1600 or 1.6kΩ resistor, 0 = 0Ω (jumper).

Chip capacitors generally do not have the value indicated on the capacitor. The color of the component indicates the general range of the capacitance.

Chip transistors are identified by a two letter code. The first letter indicates the type and the second letter, the grade of transistor.

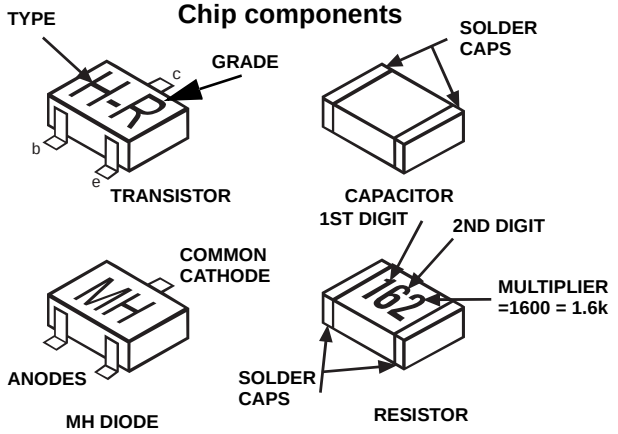
Chip diodes have a two letter identification code as per the code chart and are a dual diode pack with either common anode or common cathode. Check the parts list for correct diode number.

Component removal

1. Use solder wick to remove solder from component end caps or terminal.
2. Without pulling up, carefully twist the component with tweezers to break the adhesive.
3. Do not reuse removed leadless or chip components since they are subject to stress fracture during removal.

Chip component installation

1. Put a small amount of solder on the board soldering pads.
2. Hold the chip component against the soldering pads with tweezers or with a miniature alligator clip and apply heat to the pad area with a 30 watt iron until solder flows. Do not apply heat for more than 3 seconds.

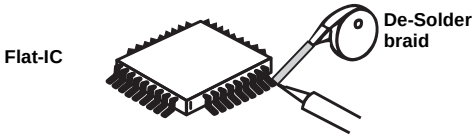


How to replace Flat-IC

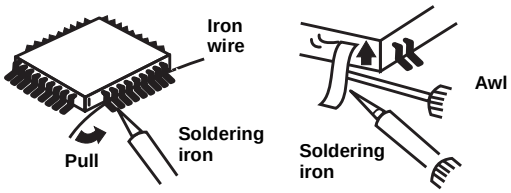
- Required Tools -

- Soldering iron
- De-solder braids
- Iron wire or small awl
- Magnifier

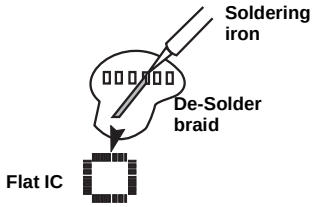
1. Remove the solder from all of the pins of a Flat-IC by using a de-solder braid.



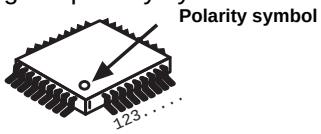
2. Put the iron wire under the pins of the Flat-IC and pull it in the direction indicated while heating the pins using a soldering iron. A small awl can be used instead of the iron wire.



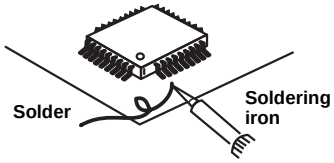
3. Remove the solder from all the pads of the Flat-IC by using a de-solder braid.



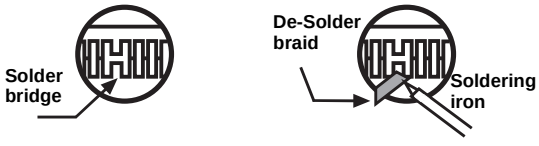
4. Position the new Flat-IC in place (apply the pins of the Flat-IC to the soldering pads where the pins need to be soldered). Properly determine the positions of the soldering pads and pins by correctly aligning the polarity symbol.



5. Solder all pins to the soldering pads using a fine tipped soldering iron.



6. Check with a magnifier for solder bridge between the pins or for dry joint between pins and soldering pads. To remove a solder bridge, use a de-solder braid as shown in the figure below.



Service notes (continued)

IMPORTANT: To protect against possible damage to the solid state devices due to arcing or static discharge, make certain that all ground wires are securely connected.

CAUTION: The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing the receiver to avoid damage to the test equipment or to the chassis. Connect the test equipment to the proper ground (⏚) or (⏚) when servicing, or incorrect voltages will be measured.

WARNING: This receiver has been designed to meet or exceed applicable safety and x-ray radiation protection as specified by government agencies and independent testing laboratories.

To maintain original product safety design standards relative to x-ray radiation and shock and fire hazard, parts indicated with the symbol ⚠ on the schematic must be replaced with identical parts. Order parts from the manufacturer's parts center using the parts numbers shown in this service manual, or provide the chassis number and the part reference number.

For optimum performance and reliability, all other parts should be replaced with components of identical specification.

Horizontal oscillator disable circuit

This chassis employs a special circuit to protect against excessive high voltage and beam current. If, for any reason, the high voltage and beam current exceed a predetermined level this protective circuit activates and detunes the horizontal oscillator that limits the high voltage. The over-voltage protection circuit is not adjustable. However, if components indicated by the symbol ⚠ on the schematic in either the horizontal sweep system or the over-voltage protection circuit itself are changed, the operation of the circuit should be checked using the following procedure:

Equipment needed to check the disabled circuit:

1. DC ammeter

2. High voltage meter (0- 50kV electrostatic)

3. Variac or isolation transformer

4. HHS jig (see Fig. 2)

Figure 2. HHS jig

Preparation

1. Connect receiver to AC 120 Volts. Do not turn ON.
2. Connect HIGH VOLTAGE meter to 2nd anode (H.V. button).

Note: *Use cold ground(⏚) for negative lead.*

3. Connect the ammeter serial from the flyback anode lead to the picture tube anode socket.
4. Prepare HHS jig to be connected between TPD50 and TPD51 as shown in Fig. 2.

Procedure:

1. Open connector A17.
2. Turn power ON and apply a white pattern.
3. Set current within 50-100μA by changing the picture and bright controls.
4. Turn power OFF.
5. Connect HHS jig between **TPD50** and **TPD51** (VR should be turn fully clockwise).
6. Turn power on.
7. Turn slowly the variable resistor to increase the current until the horizontal sync frequency abruptly increases indicating that the horizontal frequency is just beginning to pull out of sync. Maintain the current within 50-100μA by changing the picture and bright controls
8. Observe the high voltage meter. **HIGH VOLTAGE** should read less than **36kV**.
9. Turn power OFF, remove HHS jig, HV meter, ammeter and connect A17 connector.
10. Turn power ON. Reset PICTURE and BRIGHTNESS controls. Confirm **B+ 140V±1.5V** with 120V AC applied.

Note: *If high voltage is not within the specified limit, the cause must be determined before the receiver is returned to the owner.*

Receiver feature table

FEATURE\MODEL	CT-32SX12F/UF/CF	CT-36SX12F/UF/CF
Chassis	NA9FL	
Number of channels	181	
Menu language	Eng/Span/Fr	
Closed Caption	X	
V-Chip (USA/CANADA)	X	
Remote model number	EUR7613Z10	
Picture tube	MDDA	
Comb filter	ADV 3 DIG (NEW)	
VM	X (DIGITAL)	
V/A norm (X=BOTH)	X	
Color temp	X	
Preset/input labeling	X	
Video picture memory	X	
MTS/SAP/DBX	X	
BASS/BL/TRE control	X	
AI Sound	X	
Surround	X	
SPATIALIZER/BBE	BBE	
Built-in audio power	10W X 2	
Number of speakers	2	
A/V in (rear/front)	3(2/1)	
S-VHS input (rear/front)	1/1	
Component input (Y,Pb,Pr)	1	
Audio Out (FAO: F, VAO: V)	F,V	
EPJ/HPJ/MISC	HPJ	
Dimensions mm (WxDxH) in	894x685x809 35.19x26.96x31.85	1049.5x742x895 41.32x29.21x35.23
Weight (kg/lbs)	72.5/159.83	98.5/217.15
Power source (V/Hz)	120/60	
Anode voltage	31.0kV ± 1.0kV	
Video input jack	$1V_{p-p}$ 75Ω, phono jack	
Audio input jack	500mV RMS 47kΩ	

Specifications are subject to change without notice or obligation. Dimensions and weights are approximate.

Table 1. Receiver features

Board description table

BOARD	CT-32SX12F/UF/CF	CT-36SX12F/UF/CF	Description
A-Board TNP2AH037	AC	AA	MAIN CHASSIS
G-Board TNP2AA113	NIL		KEY BOARD, FRONT A/V
L-Board TNPA1673	AC		CRT BOARD
D-Board TNP2AH041	AB	NIL	POWER SUPPLY

*** Note:** *When ordering a replacement board assembly, append an "S" to the board number.*
Example: To order the A-Board for CT-27SX12MF, the replacement board is TNP2AH025AFS.

Location of controls (receiver)

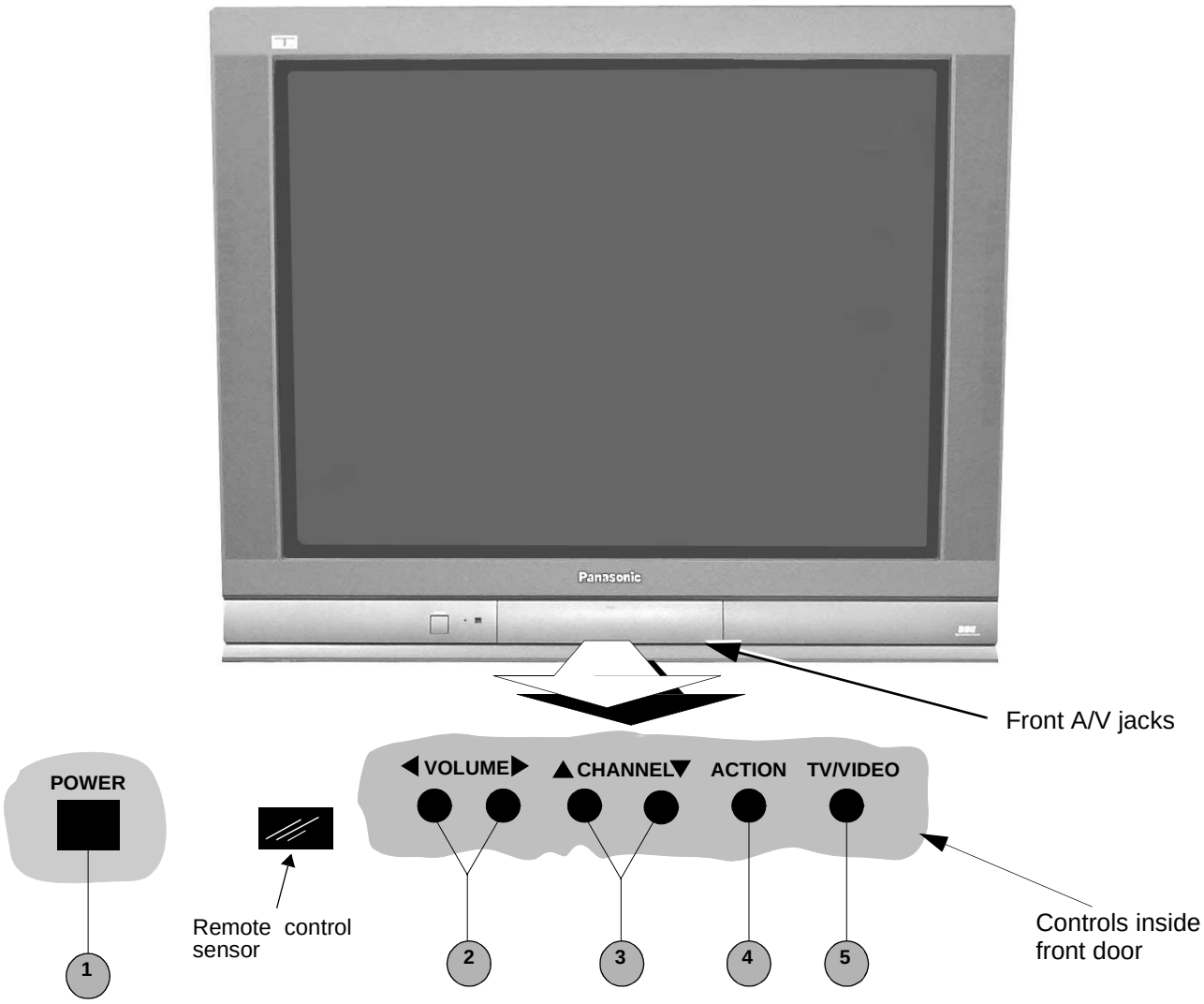


Figure 3. Location of controls (receiver).

Quick reference control operation	
1	**Power button -** Press to turn ON or OFF.
2	**Volume buttons -** Press to adjust sound level, or to adjust audio menus, video menus, and select operating features when menus are displayed
3	**Channel buttons -** Press to select programmed channels. Press to highlight desired features when menus are displayed. Also use to select cable converter box channels after programming remote control infra-red codes (the TV/AUX/CABLE switch must be set in CABLE position).
4	**Action button -** Press to display main menu and access on screen feature and adjustment menus.
5	**TV/Video button -** Press to select TV or video input.

Location of controls (remote)

POWER button
Press to turn ON and OFF.
MUTE button
Press to mute sound. A second press resumes sound.
TV, VCR, DBS/CBL, DVD
Press to select remote operation
VOL (volume) buttons
Press to adjust TV sound level. Use with channel buttons to navigate in menus.
R-TUNE (Rapid Tune) button.
Press to switch to the previous channel.
ACTION button
Press to display main menu and access or exit on screen features and adjustment menus.
REW, PLAY, FF, TV/VCR, STOP, PAUSE, REC, VCR/DBS CHANNEL
Component function buttons.
TV/VIDEO button
Press to select TV or Video input.
CH (channel) buttons
Press to select channels. Use with volume buttons to navigate in menus.
GUIDE, EXIT buttons
DBS functions button
RECALL button
Press to display time, channel, sleep timer and other options
SAP button
Press to access second audio program
MENU button
Press to access DBS or DVD menus

EUR7613Z10

Figure 4. Location of controls (remote).

Disassembly for service

Back cover

Remove all the screws marked with an arrow(◄) from the back of the receiver.

Note: *Screw configuration, type, and number of screws vary depending on the model of the receiver serviced and the application; various models are covered in this manual. Use same hardware when reassembling the receiver.*

- 4 screws at the top edge of the receiver.
- 3 screw by the A/V jacks.
- 1 screw at each lower corner of the receiver.
- 1 screw by the retainer plate of the AC power cord.

A-Board - Main chassis

The A-Board assembly rest on a chassis tray along with the D-Board. Slide chassis tray out. Gently lift tray and pull out. Disconnect plug connectors; release wire ties and holders as required for complete chassis removal.

1. A & D-Boards are secured to the chassis tray with screws.
2. The A-Board is mated to the D-Board by three flexible connectors: A5, A6 & A7 (D5, D6 & D7 on the D-Board, respectively), A1, A2 & A3 (G1, G2 & G3 on the G-Board, respectively), D40 to G40. To remove either boards, unplug the connectors on the A-Board.

Note: *Some tie-wraps that secure the wire dressings may need to be unfastened for chassis removal.*

L-Board - CRT output

Plugs into the socket on the CRT neck.

To remove this board, first unplug the board from the CRT neck, then disconnect L1, L2 & L3 connectors, to disconnect the focus F1 (red cable) & F2 (white cable) cables, pull the tab and release the cables, finally disconnect the screen cable from the D-Board fly-back.

To reinsert back the cables, remember the original position of cables, F1 (red cable) goes to A on the CRT socket and F2 (white cable) goes to B on the CRT socket.

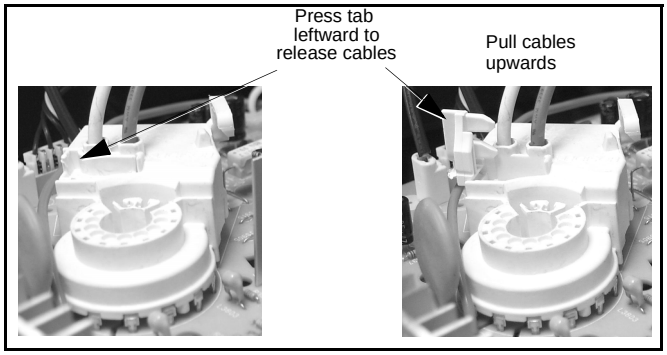


Figure 5. F1 & F2 cables release

To release screen GND cables from L-Board L11 & L12 connectors, insert a wire in both sides of connector and pull upwards the cable, then remove the wire (see Fig. 6)

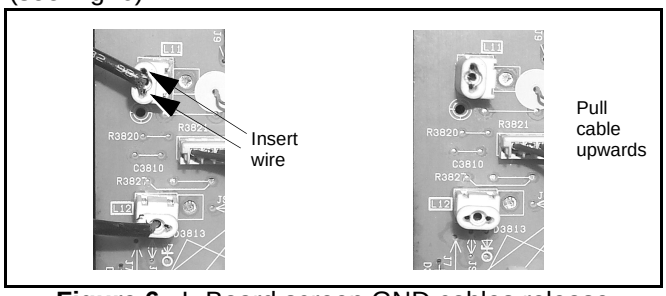


Figure 6. L-Board screen GND cables release

Speakers

Speaker is secured to the cabinet's front with 4 screws.

Keyboard push button assembly

Fastened to the inside of the cabinet front.

Disassembly for CRT replacement

1. Discharge the CRT as instructed in the **safety precautions** (see page 2).
2. Disconnect the yoke (DY) plug, degaussing coil (DEG) plug and the CRT 2nd anode button from the board.
3. Remove the L-Board from the CRT socket and unplug the black wires (CRT dag ground) L11 & L12.
4. Lift the main chassis (A-Board) and all mounted boards completely out with the CRT Board attached.

CRT replacement

1. Perform **disassembly for CRT replacement** procedure.
2. Insure that the CRT H.V. Anode button is discharged before handling the CRT. Read the **safety precautions** (see page 2) on handling the picture tube.
3. Remove the components from the CRT neck and place the cabinet face down on a soft pad.
4. Note the original order for the CRT mounting hardware as they are remove from the CRT mounting brackets at each corner of the CRT.
5. Remove the CRT with the degaussing coil and the dag ground braid attached.

Note: After servicing the receiver, remember to dress the cables.

Disassembly for service (continued)

Note: *To remove the four brackets holding the degauss coil from the corners of the CRT, first remove the CRT from the cabinet, then remove the brackets by pressing the tab on the bracket and pull upwards. These brackets are included in the degauss coil kit, for part number, please see parts list section (see Fig. 7).*

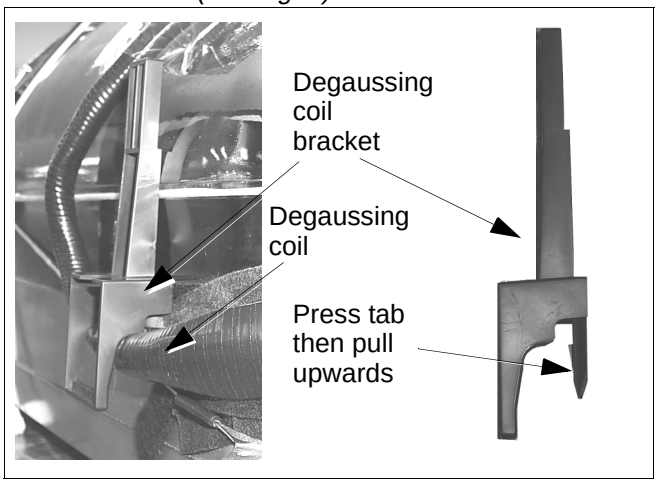


Figure 7. Brackets removal

6. Note the original locations and mounting of the degaussing coil and the dag ground assembly to insure proper reinstallation on the replacement CRT.
   To remove and remount the degaussing coil: The degaussing coil is held in place by clampers fastened to the CRT corner ears. These clampers must be installed onto the replacement CRT prior to mounting the degaussing coil.
   To remove and remount the dag ground braid:
   a. Unhook the coil spring from the bottom corners of the CRT ears.
   b. Release the braid loop from the upper corners of the CRT ears.
7. Mount the dag ground braid on the replacement CRT. Position the degaussing coil with new ties. Dress coil as was on the original CRT.
8. Replace the components on CRT neck and reinstall into cabinet. Verify that all ground wires and circuit board plugs get connected.

Note: *Reuse all the clampers and mounting brackets from the degaussing coil and screen, and when remounting the degaussing coil assure that is not touching the speakers, this can be done by placing some tape (see Fig. 7), this may cause mask vibration. The mounting brackets and clampers are not supplied with the replacements.*

Important notice:

When ordering the CRT, please order CRT and CRT KIT also. Please see parts list section for part numbers

Back cover removal

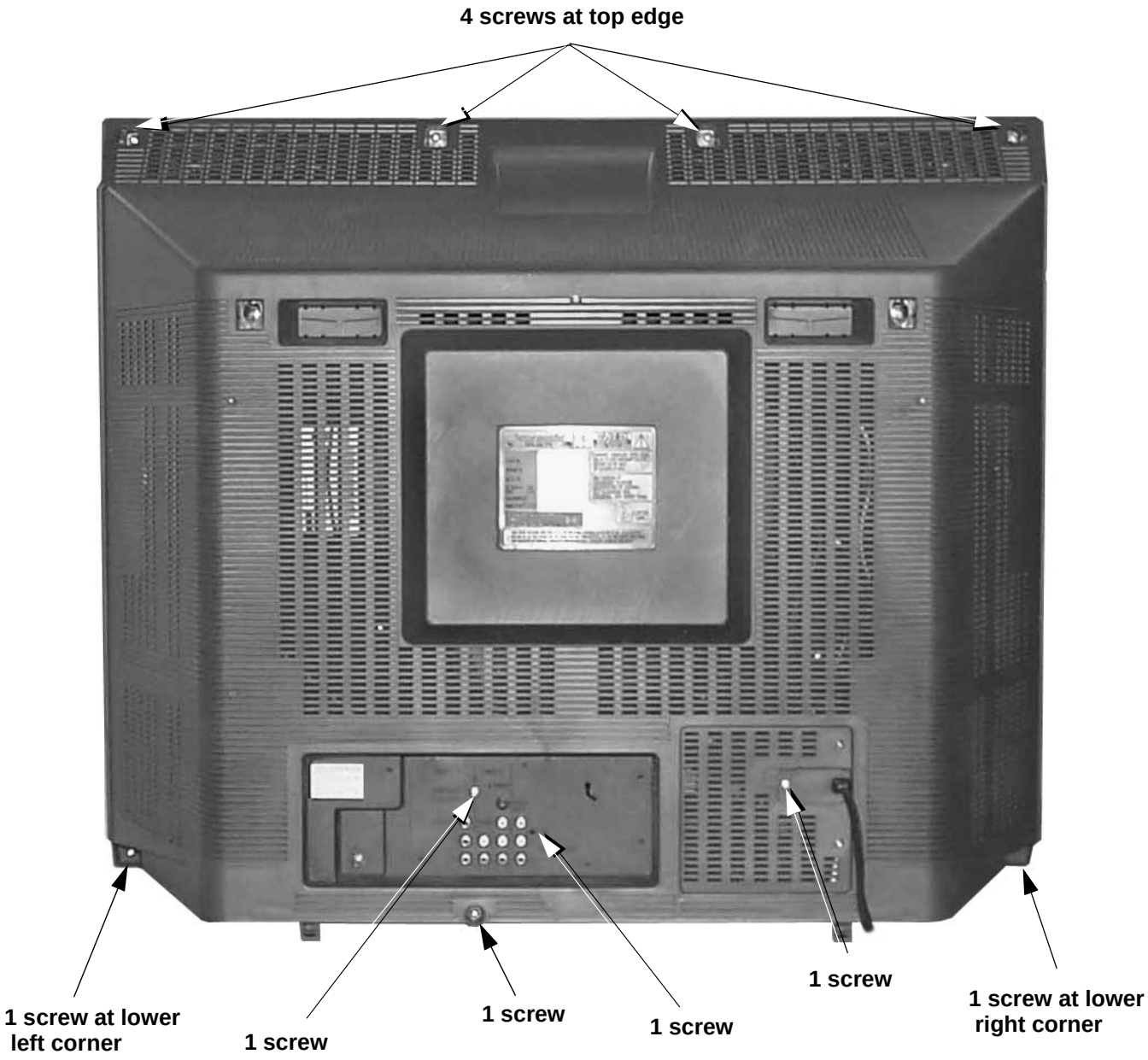
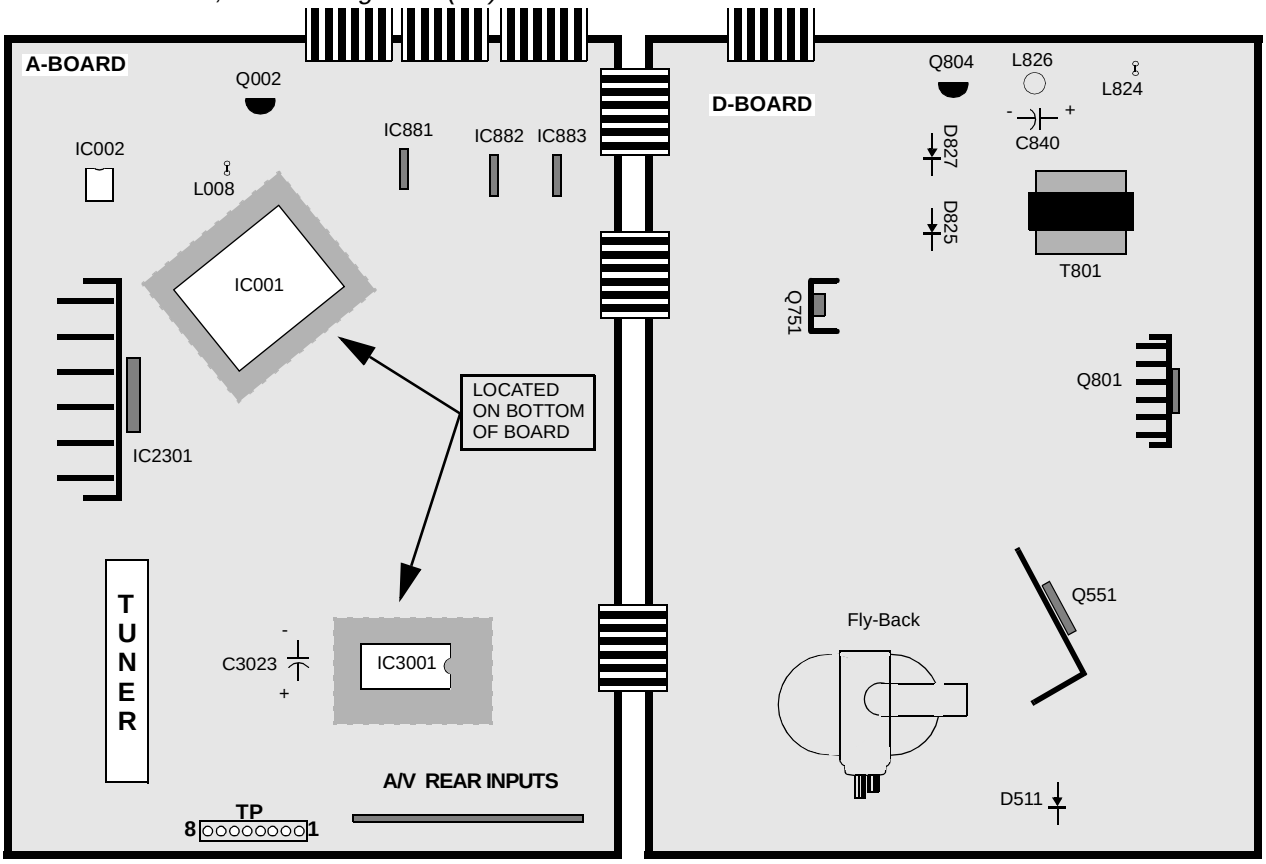


Figure 8. Back cover removal

Chassis service adjustment procedures

All service adjustments are factory preset and should not require adjustment unless controls and/or associated components are replaced.

Note: *Connect the (-) lead of the voltmeter to the appropriate ground. Use heat sink when the HOT ground symbol (⏚) is used. Otherwise, use COLD ground (⏚) — tuner shield.*



MOMENTARILY CONNECT A JUMPER FOR ENTERING SERVICE MODE (TP8 to COLD GND)

140.0V B+ Voltage confirmation

1. Set the **BRIGHT** and the **PICTURE** to Minimum by using the picture menu.
2. Connect the DVM between **TPP17** (+ side) and cold ground (⏚).
3. Confirm that B+ voltage is **140.0V ± 1.5V**. This voltage supplies B+ to the horizontal output & flyback circuits.

Source voltage chart

120V AC line input. Set the **BRIGHT** and the **PICTURE** to minimum by using the picture menu. Use cold ground (⏚) for the (-) lead of the DVM.

.

LOCATION (D-Board)		VOLTAGE
TPP17	*(by D825)* +B2	140.0V ± 1.5V
TPP25	*(by D827)* 9V	9.0V ± 1.5V
TPP19	*(by Q804)* 15V	15.0V ± 2.0V
TPP20	*(by C840)* 15V (VER.)	15.0V ± 1.5V
TPP21	*(by L826)* -15V (VER.)	-15.0V ± 1.5V
TPP22	(*by L824*) SOUND	32.5V ± 2.0V

LOCATION (D-Board)		VOLTAGE
TPD7	*(by D511)* 220V	220.0V ± 9.0V
LOCATION (A-Board)		**VOLTAGE**
TPA6	*(by IC883)* MAIN 12V	12.0V ± 0.5V
TPA7	*(by IC3001)* MAIN 9V	9.0V ± 0.5V
TPA8	*(by L008)* MAIN 5V	5.0V ± 0.3V
TPA16	*(by Q002)* STBY 3.3V	3.3V ± 0.2V
TPA18	*(by C3023)* BTL 30V	32.0V ± 2.0V

Adjust Picture menu for normalized video adjustments.

High voltage check

1. Select an active TV channel and confirm that horizontal is in sync.
2. Adjust BRIGHTNESS and PICTURE using PICTURE Icon menu so video just disappears.
3. Confirm B+ 140.0V is within limit.
4. Using a high voltage meter confirm that the high voltage is **31.0kV ± 1.0kV**.

Purity and convergence procedure

Adjustment is necessary only if the CRT or the deflection yoke is replaced or if the setting was disturbed. The complete procedure consists of:

1. Vertical raster shift adjustment. **(Only for models with purity/convergence assembly with 4 pairs of rings)**.
2. Initial static convergence.
3. Setting the purity.
4. Final static convergence.

When the CRT or the yoke is replaced

Place the yoke on the CRT neck (do not tighten the clamp).

Place the vertical raster shift tabs at 3 o'clock (90º from the purity and convergence tabs)

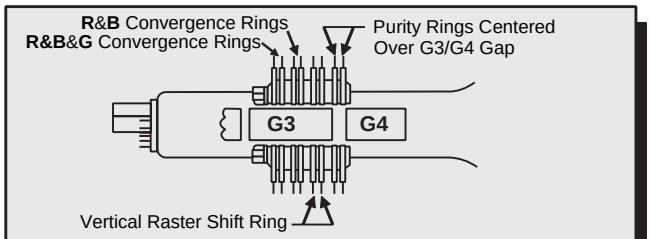


Figure 9. **Positioning of purity/convergence assembly (4 pairs of rings)**

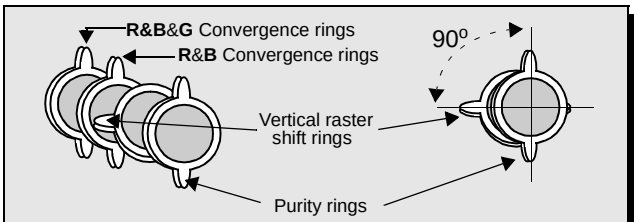


Figure 10. **Positioning of purity/convergence assembly (4 pairs of rings)**

Turn the receiver ON. Operate the receiver for 60 minutes using the first purity check field (white screen) to stabilize the CRT.

Fully degauss the receiver by using an external degaussing coil.

Slide the deflection yoke back and forth on the neck of the CRT until it produces a near white, uniform raster.

Vertical raster shift adjustment

(only for models with purity/convergence assembly with 4 pairs of rings).

Apply a green pattern with a horizontal line, adjust the deflection yoke so that has no tilt, then secure it.

Adjust center line of the pattern with the mechanical center of the CRT, this center is determined by two marks at the side edges of the screen. To adjust the line, once the vertical raster shift tabs are place at 3 o'clock to reduce its magnetic field effect (see Fig. 9 and Fig. 10) open the tabs the same angle from the center, until the center line of the pattern becomes a straight line, centered with the marks of the CRT. (see Fig. 11)

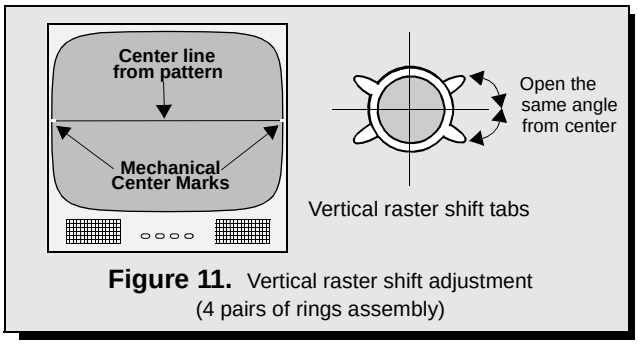


Figure 11. Vertical raster shift adjustment (4 pairs of rings assembly)

Initial center static convergence

Connect a dot/cross hatch generator to the receiver and tune in a signal. Observe misconvergence at center of the screen only.
Adjust the R&B pole magnets; by separating tabs and rotating to converge blue with red.
Adjust the R&B and R&B&G pole magnets: by separating tabs and rotating to converge blue and red (magenta) with green.

Note: *Precise convergence adjustment at this point is not important.*

Purity adjustment

When the receiver is in the service mode for making electronic adjustments, press the **RECALL** button on the remote control to enter purity check. (See the **service adjustments electronic controls** procedure).
Operate the receiver for 60 minutes using the first purity check field (white screen) to stabilize the CRT.
Fully degauss the receiver by using an external degaussing coil.
Press the **RECALL** button on the remote control again until the purity check (green screen) appears.
Loosen the deflection yoke clamp screw and move the deflection yoke back as close to the purity magnet as possible.
Adjust the purity rings to set the vertical green raster precisely at the center of the screen (see Fig. 12).

NOTES:
1. CRT warm up with white screen (three guns activated) is needed to stabilize the shadow mask expansion.
2. Initial center static convergence (roughly centers three gun beams) is required in order to perform purity adjustment.

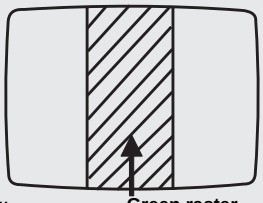


Figure 12. Green raster adjustment

Slowly move the deflection yoke forward until the best overall green screen is displayed.
Tighten the deflection yoke clamp screw.
Press the **RECALL** button on the remote control again until the purity check blue and red screens appear and observe that good purity is obtained on each respective field.
Press the **RECALL** button on the remote control again until purity check (white screen) appears. Observe the screen for uniform white. If purity has not been achieved, repeat the above procedure.

Final convergence procedure

(see Fig. 17 through Fig. 19):
Note: *Vertical size and focus adjustments must be completed prior to performing the convergence adjustment. Connect a dot pattern generator to the receiver. The* ***BRIGHTNESS*** *level should not be higher than necessary to obtain a clear pattern.*
Converge the red and the blue dots at the center of the screen by rotating the R&B pole static convergence magnets.
Align The converged red/blue dots with the green dots at the center of the screen by rotating the R&B&G pole static convergence magnets. Melt wax with soldering iron to reseal the magnets.
Slightly tilt vertically and horizontally (do not rotate) the deflection yoke to obtain a good overall convergence.
If convergence is not reached at the edges, insert permalloy (see following section) from the DY corners to achieve proper convergence. Recheck for purity and readjust if necessary.
After vertical adjustment of the yoke, insert wedge at 11 o'clock position, then make the horizontal tilt adjustment.
Secure the deflection yoke by inserting two side wedges at 3 and 7 o'clock positions.
Apply adhesive between tab (thin portion) of wedge and CRT and place tape over the tab to secure to the CRT.

Dynamic corvergence adjustment

Use this for a precisely overall convergence adjust at the edges.

DY(Y_{HC}, Y_V, X_V) adjustment

Y_V Adjustment
(VR1 for Horizontal dynamic convergence)

1. Apply a crosshatch pattern.
2. Adjust contrast and brightness customer controls to obtain a correct picture.
3. With a driver adjust VR1 (located in deflection yoke board Fig. 19) to obtain a proper corvergence at top and bottom of the screen (see Fig. 13)

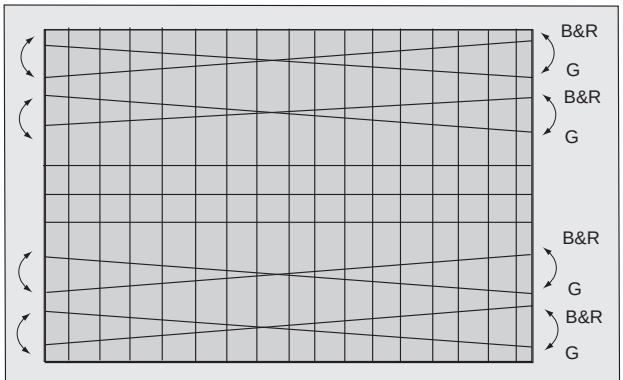


Figure 13. VR1 Adjustment (Y_V)

Y_H Adjustment
(VR2 for vertical dynamic convergence)

1. Apply a crosshatch pattern.
2. Adjust contrast and brightness customer controls to obtain a correct picture.
3. With a driver Adjust VR2 (located in deflection yoke board Fig. 19) to obtain a proper corvergence at left and right side of the screen. (see Fig. 14)

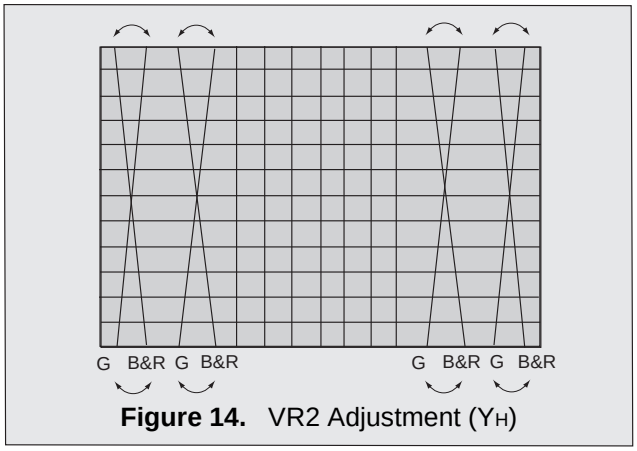


Figure 14. VR2 Adjustment (Y_H)

X_V Adjustment (precise adjustment)

1. Apply a crosshatch pattern.
2. Adjust contrast and brightness customer controls to obtain a correct picture.
3. With a driver adjust the coil located in deflection yoke board to obtain a proper convergence horizontally.

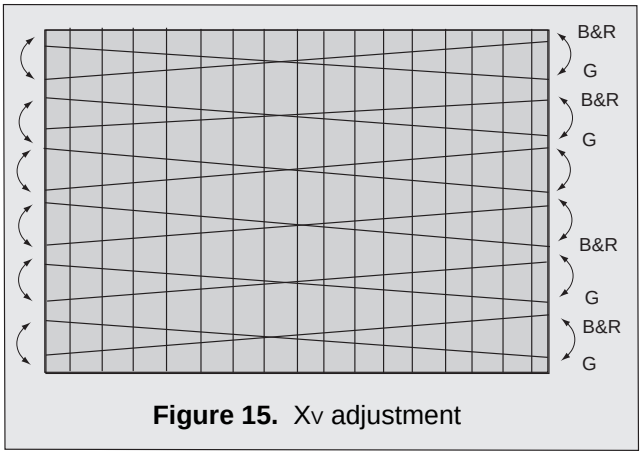


Figure 15. X_V adjustment

Note: *Apply a red pattern and confirm purity, if purity is poor, repeat purity adjustments.*

Permalloy convergence corrector strip (part No. 0FMK014ZZ)

This strip is used in some sets to match the yoke and CRT for optimum convergence. If the yoke or CRT is replaced, the strip may not be required.
First converge the set without the strip and observe the corners.

If correction is needed:

1. Place strip between CRT and yoke, in quadrant needing correction. Slowly move it around for desired results.
2. Press adhesive tightly to the CRT and secure with tape.

DAF adjustment

Preparation:

1. Apply a crosshatch pattern.
2. Set user controls, bright to center and picture to max.
3. Connect a frequency counter to TPD10.

Procedure:

1. Connect channel one of the oscilloscope with 100x1 probe to TPP33 (pin-1 T1551).
2. Connect channel two of the oscilloscope with 10x1 probe to CRT HEATER (L-Board).
3. Adjust “HDAFP” so both waves are in the same position.
4. Adjust “HDAFW” so TPP33 is 1.5 ± 0.5kVpp.

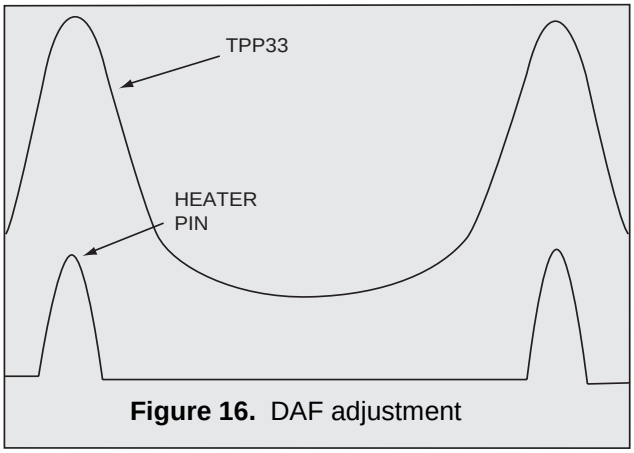
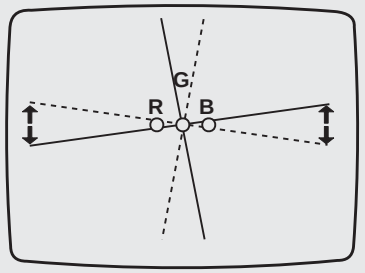
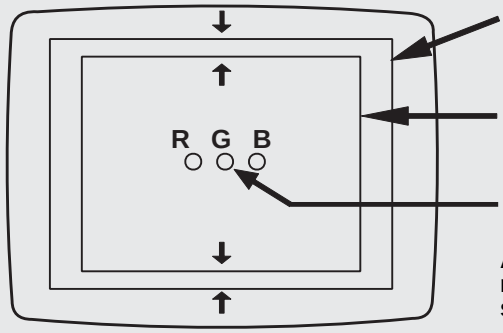


Figure 16. DAF adjustment



As the yoke is tilted vertically, the rasters produced by the outside guns rotate in opposite directions.

Figure 17. Vertical yoke movement



Raster produced from one of the outside electron beams

Raster from the other side electron beam

Static convergence magnets are set for center convergence

As the yoke is tilted horizontally, one raster gets larger while the other gets smaller

Figure 18. Horizontal yoke movement

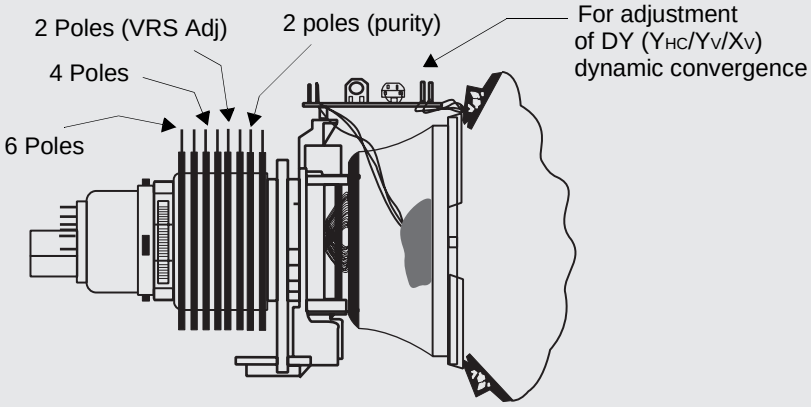


Figure 19. Convergence magnets and convergence controls

IMPORTANT NOTE:
Always exit the service mode following adjustments.

Service mode (electronic controls)

This receiver has electronic technology using the I²C bus concept. It performs as a control function and it replaces many mechanical controls. Instead of adjusting mechanical controls individually, many of the control functions are now performed by using “on screen display menu”. (The **service adjustment mode**).

Note: *It is suggested that the technician reads all the way through and understand the following procedure for entering/exiting the **service adjustment mode**; then proceed with the instructions working with the receiver. When becoming familiar with the procedure, the flow chart for service mode may be used as a quick guide.*

Quick entry to service mode:

When minor adjustments need to be done to the electronic controls, the method of entering the service mode without removal of the cabinet back is as follows using the remote control:

1. Select SET-UP icon and select CABLE mode.
2. Select TIMER icon and set SLEEP time for 30 Min.
3. Press “ACTION” twice to exit menus.
4. Tune to the channel 124.
5. Adjust VOLUME to minimum (0).
6. Press VOL ◀ (decrease) **on receiver**. Red “CHK” appears in upper corner.+

Note: *After receiver is set into service mode, set TIMER back to NO.*

To toggle between aging and service modes:

While the “CHK” is displayed on the left top corner of the CRT, pressing “ACTION” and “VOL” up on the TV simultaneously will toggle between the modes. Red “CHK” for service and yellow “CHK” for aging.

7. **Press POWER** on the **remote control** to display the service adjustment modes menu, select adjustment by pressing the volume right/left buttons and channel up/down buttons on the remote and ACTION to enter the adjustment.

MTS	MTSIN	SEPAL	SEPAH	
CLOCK	CLOCK			HHSTH
VIDEO	COLOR	TINT	BRIGH	CONT
	B-Y_G	CUT_G	CUT_R	CUT_B
	BRT	R-DR	B-DR	
PIP	PCONT			
HDEF	H-POS	H-WID	PCC	
	TOPG	BTMG	TRAP	
FINE	PCCHG	PCCLG	PCCHS	PCCLS
	TOPSL	BTMSL	SIDE	HTRAP
VDEF	VRAS	VEAMP	V-C	V-S
DAF	HDAFS	VDAFG		VPOS
CTEMP	WARMR	WARMB	COOLR	COOLB

Figure 20. Service mode menu adjustments.

Exiting the service mode:

This TV goes out from service mode when it is unplugged or turned OFF. To exit the service mode, turn the TV OFF or unplug the TV from AC.

Other method

Press **ACTION** and **POWER** on the **receiver** simultaneously for at least 2 seconds.

The receiver momentarily shuts off; then comes back on tuned to channel 3 with a preset level of sound.

Any programmed channels, channels caption data and some others user defined settings will be erased when exited by pressing ACTION and POWER on receiver.

IMPORTANT NOTE:
Always check that the TV exits the service mode.

To check colors:

Press **RECALL** on the **remote control** when in service mode (red “CHK” is displayed) to enter the purity field check mode.

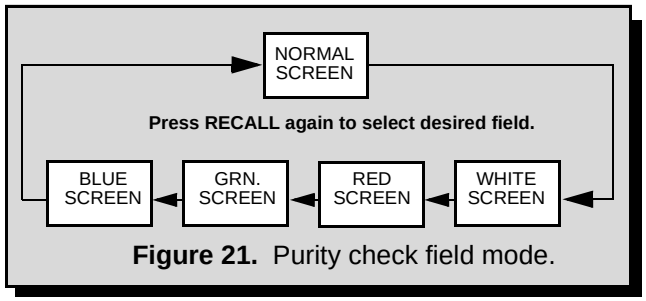


Figure 21. Purity check field mode.

Helpful hints

Entering service mode (open-back method)

- While the receiver is connected and operating in normal mode, momentarily short test point **FA1 (A15 pin 2)** to cold ground (⏚) (A-Board).
  The receiver enters the aging mode.
  Yellow letters “CHK” appear in the upper left corner of the screen.
  (The VOLUME up/down will adjust rapidly).

Note: *When entering using this method, the only way to go out of service mode is to press **ACTION** and **POWER** on the **receiver** simultaneously for at least 2 seconds.*

Service mode (electronic controls, continued)

MTS Adjustments	Description	Default Level	New Level
MTSIN	INPUT LEVEL	25	
SEPAL	LOW LEVEL SEPARATION	08	
SEPAH	HIGH LEVEL SEPARATION	1D	
CLOCK Adjustments	**Description**	**Default Level**	**New Level**
CLOCK	CLOCK	128	
HHSTH	-------	FF	
VIDEO Adjustments	**Description**	**Default Level**	**New Level**
COLOR	COLOR	01 6D	
TINT	TINT	4D	
BRIGHT	SUB-BRIGHTNESS	2D	
CONT	SUB-CONTRAST	60	
B-Y_G	MAGENTA TINT ADJ	80	
CUT_G	GREEN CUT-OFF	02 2D	
CUT_R	RED CUT-OFF	02 28	
CUT_B	BLUE CUT-OFF	02 23	
BRT	BRIGHT	2D	
R DR	RED DRIVE	09 68	
B DR	BLUE DRIVE	08 4E	
HDEF Adjustments	**Description**	**Default Level**	**New Level**
H POS	HORIZONTAL POSITIONING	8F	
H WID	HORIZONTAL WIDTH	4F	
PCC	PINCUSHION CORRECTION	1E	
TOPG	TOP CORNER PINCUSHION	13	
BTMG	BOTTOM CORNER PINCUSHION	14	
TRAP	TRAPEZOID	7E	
FINE Adjustments	**Description**	**Default Level**	**New Level**
PCCHG	PINCUSHION HIGH	15	
PCCLG	PINCUSHION LOW	07	
PCCHS	PINCUSHION HIGH	OF	
PCCLS	PINCUSHION LOW	OF	
TOPSL	TOP CORNER PINCUSHION SLICE LEVEL	0D	
BTMSL	BOTTOM CORNER PINCUSHION SLICE LEVEL	OF	
SIDE	E-W PINCUSHION ADJUSTMENT	46	
HTRAP	HORIZONTAL TRAPEZOID	20	

Service mode (electronic controls, continued)

VDEF Adjustment	Description	Default Level	New Level
V RAS	VERTICAL POSITION	2D	
VEAMP	VERTICAL SIZE	BB	
V-C	VERTICAL LINEARITY	22	
V-S	VERTICAL S CORRECTION	0E	
DAF Adjustments	**Description**	**Default Level**	**New Level**
HDAFP	HORIZONTAL DAF PHASE	00 D0	
HDAFW	VERTICAL DAF GAIN	60	
VPOS	VPOS	80	
CTEMP Adjustments	**Description**	**Default Level**	**New Level**
WARMR	-------	60	
WARMB	-------	60	
COOLR	--------	60	
COOLB	--------	60	

IMPORTANT NOTE:
Always exit the service mode following adjustments.

To check purity:

Press the **RECALL** button on the **remote control** when in service mode (red “CHK” is displayed) to enter the purity field check mode.

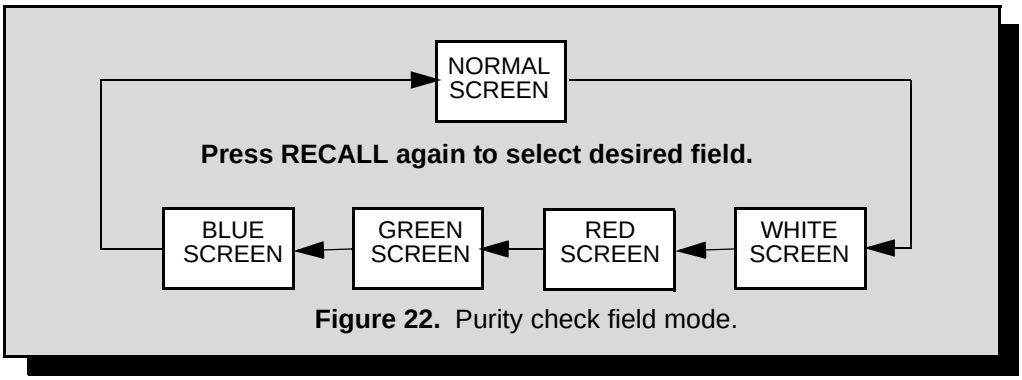


Figure 22. Purity check field mode.

IMPORTANT NOTE:
Always exit the service mode following adjustments.

Instructional flow chart for service mode

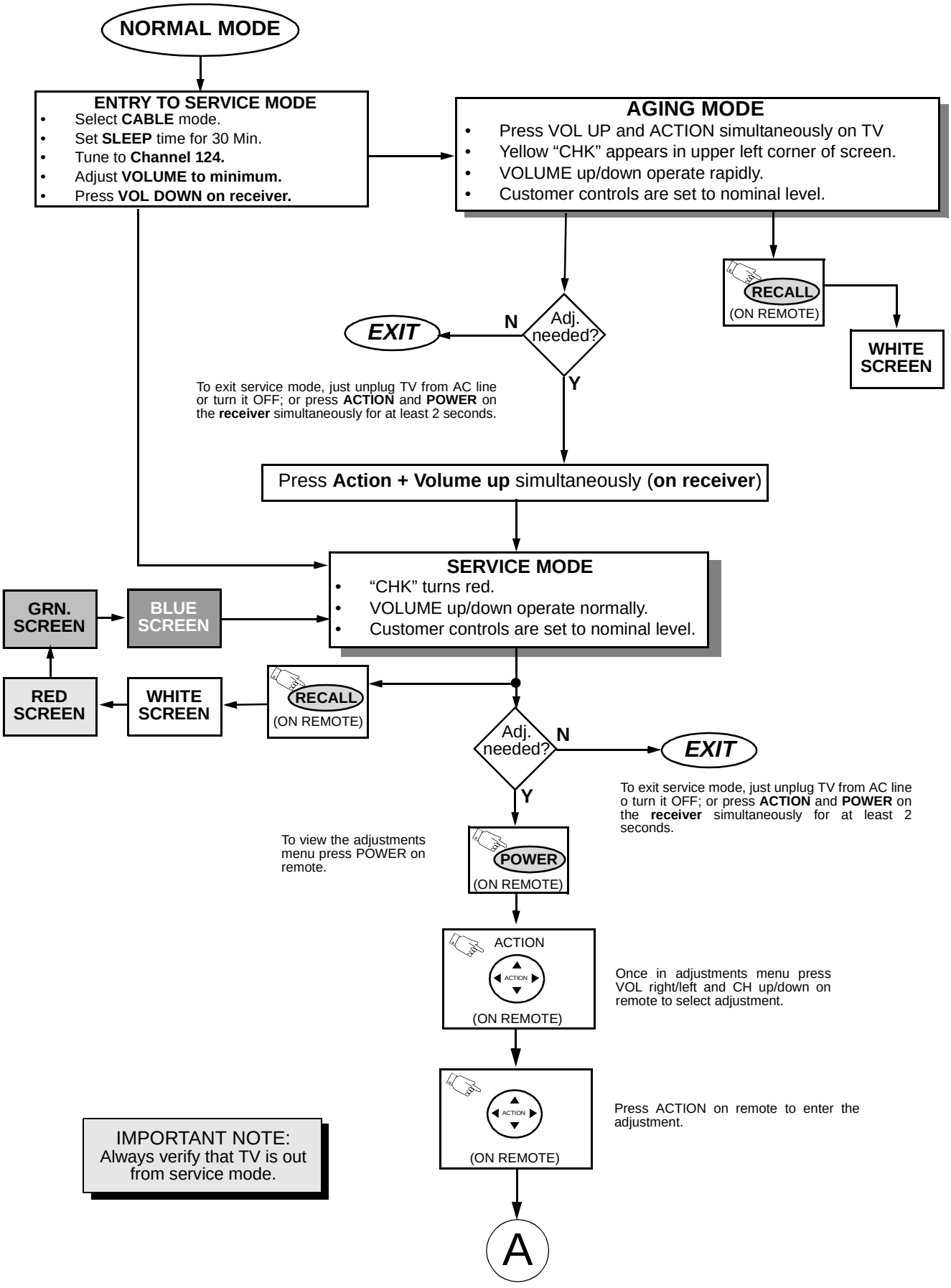

NORMAL MODE
ENTRY TO SERVICE MODE
• Select CABLE mode.
• Set SLEEP time for 30 Min.
• Tune to Channel 124.
• Adjust VOLUME to minimum.
• Press VOL DOWN on receiver.
AGING MODE
• Press VOL UP and ACTION simultaneously on TV
• Yellow "CHK" appears in upper left corner of screen.
• VOLUME up/down operate rapidly.
• Customer controls are set to nominal level.
RECALL
(ON REMOTE)
WHITE SCREEN
Adj. needed?
N
EXIT
Y
To exit service mode, just unplug TV from AC line or turn it OFF; or press ACTION and POWER on the receiver simultaneously for at least 2 seconds.
Press Action + Volume up simultaneously (on receiver)
SERVICE MODE
• "CHK" turns red.
• VOLUME up/down operate normally.
• Customer controls are set to nominal level.
GRN. SCREEN
BLUE SCREEN
RED SCREEN
WHITE SCREEN
RECALL
(ON REMOTE)
Adj. needed?
N
EXIT
Y
To exit service mode, just unplug TV from AC line o turn it OFF; or press ACTION and POWER on the receiver simultaneously for at least 2 seconds.
To view the adjustments menu press POWER on remote.
POWER
(ON REMOTE)
ACTION
(ON REMOTE)
Once in adjustments menu press VOL right/left and CH up/down on remote to select adjustment.
(ON REMOTE)
Press ACTION on remote to enter the adjustment.
IMPORTANT NOTE:
Always verify that TV is out from service mode.
A

Figure 23. Flow chart for service mode.

Instructional flow chart for service mode - (continued)

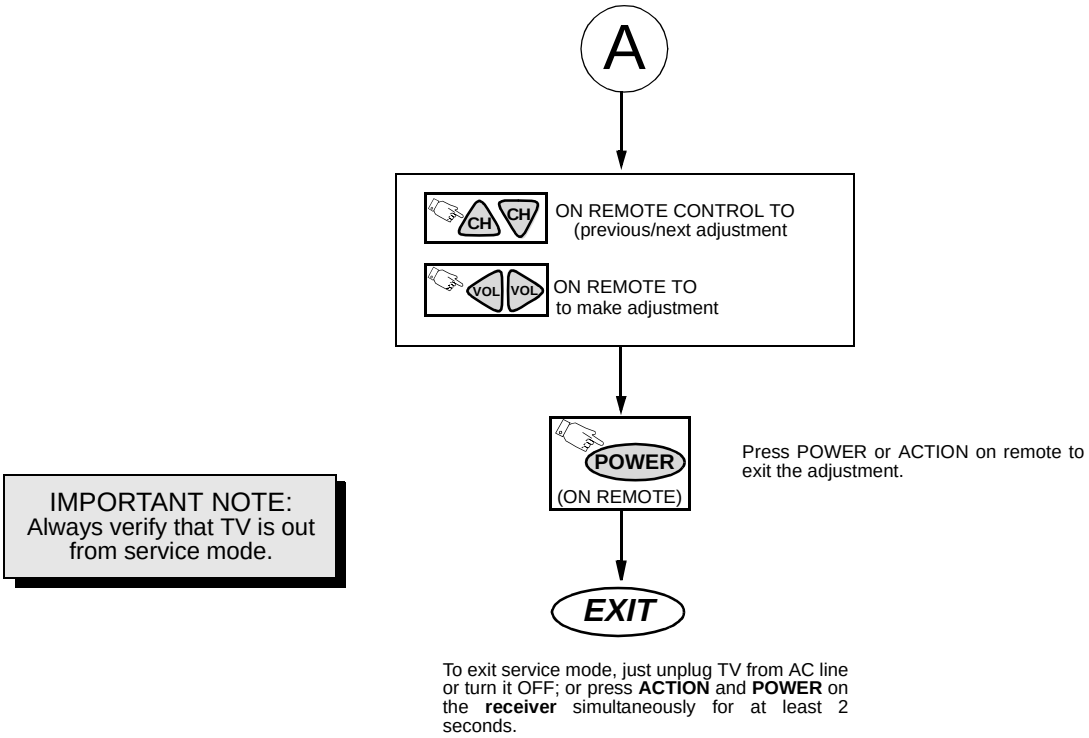

A
CH
CH
ON REMOTE CONTROL TO
(previous/next adjustment
VOL
VOL
ON REMOTE TO
to make adjustment
POWER
(ON REMOTE)
Press POWER or ACTION on remote to exit the adjustment.
IMPORTANT NOTE:
Always verify that TV is out from service mode.
EXIT
To exit service mode, just unplug TV from AC line or turn it OFF; or press **ACTION** and **POWER** on the **receiver** simultaneously for at least 2 seconds.

Figure 24. Flow chart for service mode (continued).

Service adjustments (electronic controls)

Sub-Contrast adjustment

Service DAC Adjustment (BRIGH, CONT)

This adjustment is factory set. **Do not adjust** unless repairs are made to associated circuit, the CRT Board or when the CRT is replaced.

Preparation:

1. Apply a color-bar pattern.
2. Set the picture settings to normal and color to minimum.
3. Connect the oscilloscope to TP47G.
4. Connect a jumper from TPD2 to cold ground (⏚).

Procedure:

1. In the service mode, select DAC “BRIGH” for sub-brightness to obtain 2.3±0.1V between 7.5IRE and GND level at TP47G (see Fig. 25)
2. In the service mode, select DAC “CONT” for sub-contrast to obtain 3.0±0.1V between 7.5IRE and 100IRE level at TP47G
3. Remove short jumper
4. Set the picture settings to normal..

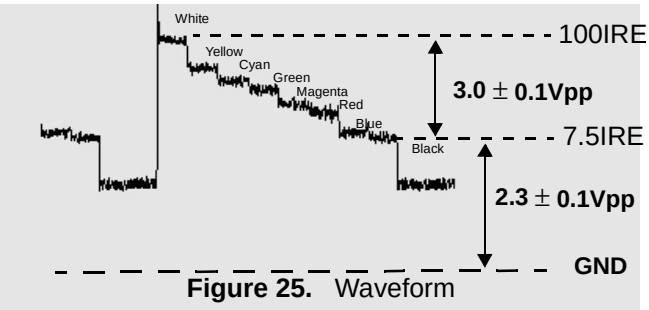


Figure 25. Waveform

Sub-Brightness

Service DAC adjustment (BRIGH)

Adjustment of this control is important for setting proper operation of customer brightness and picture controls. **Do not adjust** the SCREEN VR after the Sub-Brightness is set.

Preparation:

1. Set the picture settings to normal and color to minimum (no color in picture).
2. Switch COLOR TEMPERATURE to NORMAL.

Procedure:

1. Apply a color-bar pattern.
2. In the service mode for making electronic adjustments, select the DAC adjustment “BRIGH” and adjust data so that 7.5IRE part is the same light output as the 3IRE part.

Tint/Color adjustment

Service DAC adjustment (TINT) (COLOR)

Preparation:

1. Apply a rainbow color bar signal.
2. Preset the following controls:
   - Brightness . . . . . Min.
   - Color . . . . . Center.
   - Tint . . . . . Center.
   - Picture . . . . . Max.
   - Sharpness . . . . . Min.
3. Connect a jumper from TPD2 to GND (⏚).

Procedure:

1. Connect the oscilloscope to TP47B (A-Board).
2. In the service mode, select “TINT DAC Sub-Tint adjustment. Adjust until the waveform measured is as the one shown in Fig. 26.

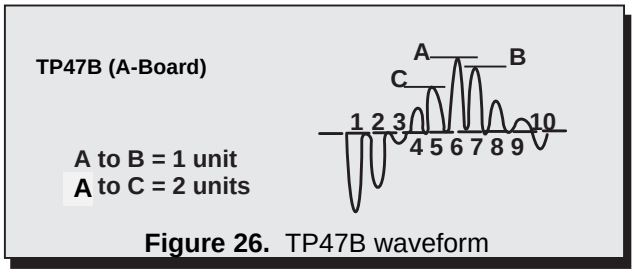


Figure 26. TP47B waveform

3. Connect the oscilloscope to TP47G (TP35) and cold GND.
4. Select DAC Sub-Color adjustment “COLOR” and adjust for peak to peak amplitude to be **1.3Vp-p ±0.1V** as shown in Fig. 27.

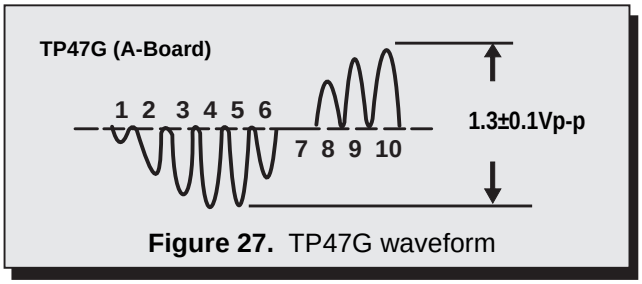


Figure 27. TP47G waveform

5. Remove short jumper.

Tint/Color adjustment

Service DAC adjustment (TINT) (COLOR)

Note: *Color, tint adjustment sets the reference settings for the user controls; It is important to read the procedures.*

(No rainbow pattern)

Make sure that sub-contrast adjustment was finished prior to perform this adjustment

Preparation:

1. Normalize the picture settings.
2. Set picture mode to VIVID

Procedure:

1. Apply a color bar pattern.
2. In service mode adjust “TINT” sub-tint data so that the color does not become greenish or redish.
3. In service mode adjust “COLOR” sub-color data so that the color level is not too high (saturated) or too low (tending to black and white).
4. confirm that saturation and picture are normal (normal image).
5. If image is not satisfactory, repeat adjustment until the image is normal and natural.
6. *The image can be compared against other set to see the image quality.*

Color temperature adjustment (B/W Tracking)

Service DAC adjust
(CUT_R) (CUT_G) (CUT_B) (R -DR) (B-DR)
Minor touch-up method

OBSERVE low and high brightness areas of a B/W picture for proper tracking. Adjust only as required for good gray scale and warm highlights”.

1. LOW LIGHT areas – In service mode for making electronic adjustments, select “CUT_R”, “CUT_G”, “CUT_B” and adjust the picture for gray.
2. HIGH LIGHT areas – In service mode for making electronic adjustments, select “CUT_G”, “CUT_B” and adjust the picture for warm whites.

Complete adjustment

Preparation:

1. Turn the receiver “ON” and allow 10 minutes warm up at high brightness.
2. Apply a color bar signal with color “OFF”.
3. Turn the SCREEN control (part of FBT T551) fully counterclockwise.

Procedure:

Preset the following service DACs for best results:

- CUT_R. 02 00
- CUT_G 02 00
- CUT_B. 02 00
- R-DR . . . . 07 FF
- B-DR . . . . 07 FF

1. Connect the oscilloscope to TP35 (L-Board).
2. In service mode for making electronic adjustment, select the sub-bright DAC “BRIGH”.
3. Press the R-TUNE key on the remote.
4. Observe the oscilloscope waveform at horizontal rate and adjust the service mode sub-bright DAC “BRIGH” level until **2.0 ± 0.05V** above DC ground is measured, as indicated in Fig. 28.

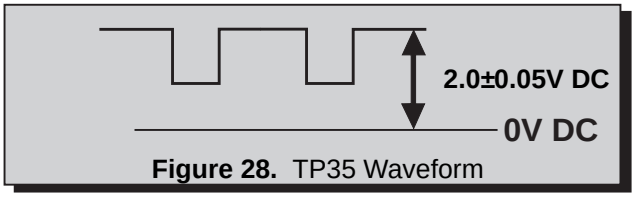


Figure 28. TP35 Waveform

5. Press the R-TUNE key on the remote.
6. Connect the scope to GREEN cathode (KG) on the CRT-Board.
7. In the service mode for making electronic adjustments, select the GREEN CUTOFF DAC “CUT_G”.
8. Press the R-TUNE key on the remote.
9. View scope trace at horizontal rate and adjust the service mode DAC “CUT_G” level until **170±2V** above DC ground is measured, as indicated in Fig. 29.
10. Press the R-TUNE key on the remote.
11. Write the same “CUT_G” data to “CUT_R” and “CUT_B”.
12. Press the R-TUNE key on the remote.
13. Turn the screen control (part of FBT) slowly clockwise until a slightly color horizontal line appears.
14. Adjust “CUT_R” and “CUT_B” until the horizontal line becomes white.
15. Press the R-TUNE key on the remote

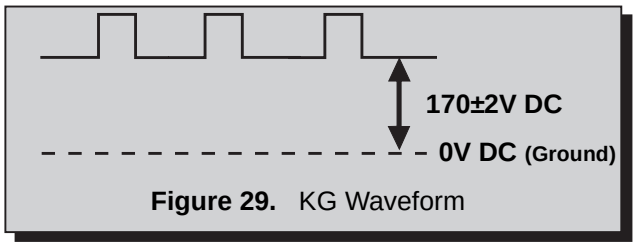


Figure 29. KG Waveform

16. Apply a normal image and check for a good picture.
17. Exit the service mode.

Service adjustments (electronic controls, cont.)

Horizontal centering (H-POS)

This adjustment helps to center the picture horizontally

Preparation:

Apply a pattern that permits the centering of the image.

Procedure:

1. In the service mode for making electronic adjustments. Select the horizontal centering adjustment DAC “H-POS” and adjust until the center of the monoscope pattern is centered on CRT.
2. Exit the service adjustment mode.

Horizontal width adjustment (H-WIDTH)

Preparation:

Apply a pattern that permits the centering of the image.

Procedure:

1. Adjust “VRAS” data so that the picture is in the center and lines are straight (check mark on CRT sides).
2. Apply a crosshatch pattern.
3. Adjust “PCC” data to make lines straight.
4. Adjust “H-WID” data to correct the horizontal width of the image.
5. Adjust “VEAMP” data to correct vetical size of the image.

Horizontal trapezoid adjustment (HTRAP)

Preparation:

1. Apply a crosshatch pattern
2. Normalize the picture settings.

Procedure:

1. Enter service mode, select “HTRAP” and adjust DATA so that horizontal lines are straight (see Fig. 30)

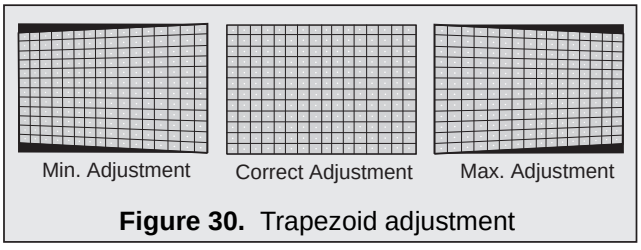


Figure 30. Trapezoid adjustment

Parallelogram adjustment (R524)

R524 is a variable resistor located on D-Board by connector D6

Preparation:

1. Apply a crosshatch pattern
2. Normalize the picture settings.

Procedure:

1. Remove the back cover.
1. With a screwdriver adjust R524 (D-Board) so that lines become straight (see Fig. 32).

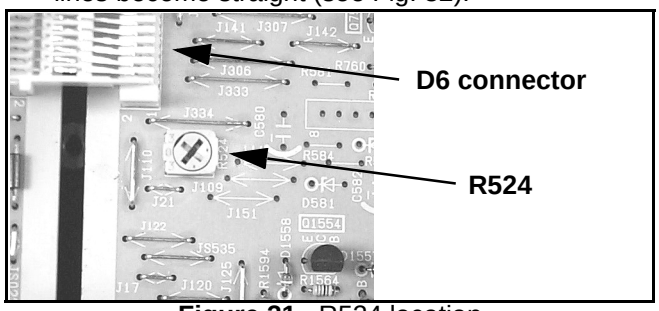


Figure 31. R524 location

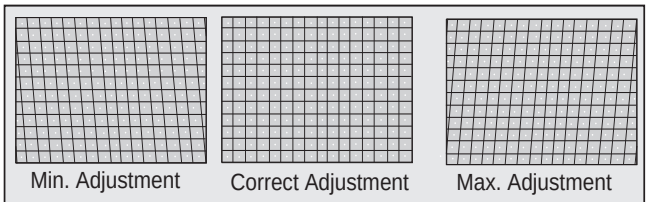


Figure 32. Parallelogram adjustment

East west PCC balance adjustment (SIDE)

Preparation:

1. Apply a crosshatch pattern
2. Normalize the picture settings.
3. Set picture mode to VIVID

Procedure:

1. Enter service mode, select “SIDE” and adjust so that lines at right and left are vertical like solid line. (see Fig. 33)

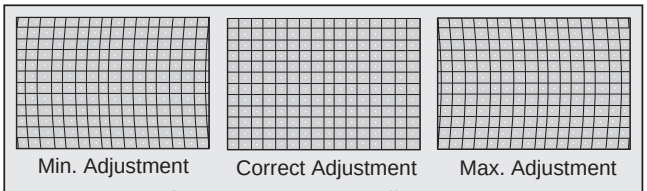


Figure 33. SIDE adjustment

Vertical linearity adjustment (V-C)

Preparation:
1. Apply a crosshatch pattern

Procedure:
1. Confirm that vertical picture is centered, or adjust “VRAS” data to correct.
1. Enter service mode, adjust linearity data “V-C” so that interval of “a” is same as “b” (a=b). (see Fig. 34)

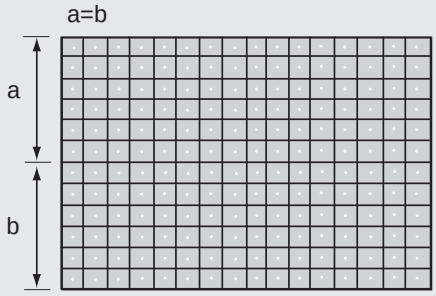


Figure 34. Linearity adjustment

Vertical correction adjustment (V-S)

Preparation:
1. Apply a Crosshatch pattern.
2. If b-a<-1.5mm (in top and bottom), increase “V-S” data by one step and adjust; repeat step until b-a≤1.5mm
3. If b-a>-1.5mm (in top and bottom), decrease “V-S” data by one step; repeat steps until b-a≤1.5mm.

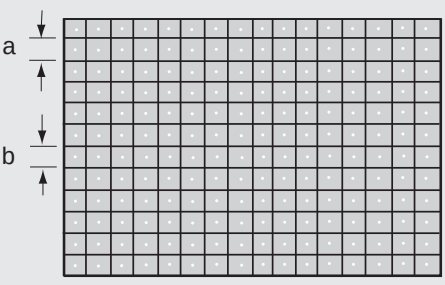


Figure 35. V-Adjustment

Vertical size and vertical position adjustment (VEAMP & VRAS)

Preparation:

Apply a pattern that permits the centering of the image.

Procedure:
1. Enter service mode
2. Adjust “VRAS” to center the picture to the marks on the CRT.
3. Adjust “VEAMP” to make image not wide or narrow vertically.

PCC adjustment (PCC)

This adjustmet helps to correct left and right curved sides of picture.

Preparation:
1. Apply a crosshatch pattern
2. Normalize the picture icon video adjustments.

Procedure:
1. Adjust “PCC” DATA so that the 1st line and 3rd line make a good balance (see Fig. 36).

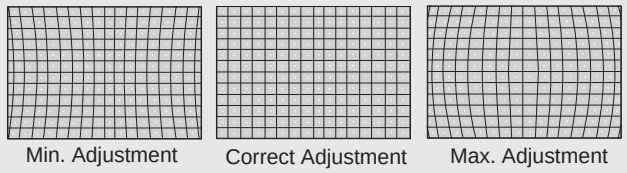


Figure 36. E-W PCC adjustment

Corner PCC adjustment (TOPG, TOPSL, BTMG, BTMSL)

This controls help to adjust top and bottom sides of picture

Preparation:
1. Apply a Crosshatch pattern
2. Normalize the picture icon video adjustments.

Procedure:
1. Adjust “TOPG” and “TOPSL” data to correct upper side of the image linearity.
2. Adjust “BTMG” and “BTMSL” data to correct lower side of the image (see Fig. 37)

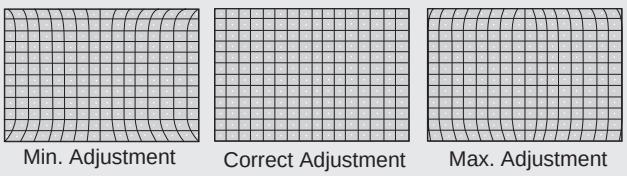


Figure 37. Top and bottom adjustment

Service adjustments (electronic controls, cont.)

MTS circuit adjustments

The MTS circuit adjustments require two steps:

1. Input level adjustment.
2. Stereo separation adjustment.

Input level adjustment (MTSIN)

Preparation:

1. Connect an RMS meter with filter jig as shown in Fig. 38.

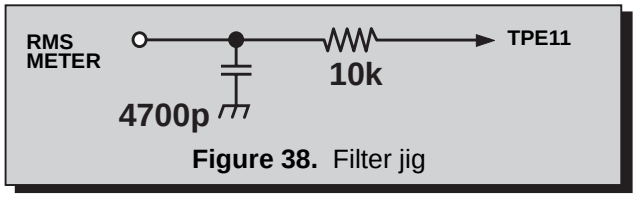


Figure 38. Filter jig

2. Connect an RF signal generator to the RF antenna input.

Procedure:

1. Apply the following signal from the RF signal generator:
   Video: 100 IRE flat field, 30% modulation.
   Audio: 300Hz, 100% modulation, monaural (70 ±5dB, 75Ω OPEN, P/S 10dB).
2. Adjust the "MTSIN" input level DAC until the voltage measured is 106 ± 6.0mV rms.

Stereo separation adjustment (SEPAL & SEPAH)

Preparation:

1. Connect an RF signal generator to the RF antenna input.
2. Connect oscilloscope to TPE10.

Procedure:

1. Select stereo mode in audio menu
2. Apply the following signal from the RF signal generator:
   Video: 100 IRE flat field, 30% modulation.
   Audio: 300Hz, 100% modulation, stereo (left only) (70 ±5dB, 75Ω OPEN, P/S 10dB).
3. Adjust the MTS low-level separation adjustment "SEPAL" until the amplitude displayed on the scope is minimum.
4. Apply the following signal from the RF signal generator:
   Video: 100 IRE flat field, 30% modulation.
   Audio: 3KHz, 100% modulation, stereo (left only) (70 ±5dB, 75Ω OPEN, P/S 10dB).
5. Adjust the MTS high-level separation adjustment "SEPAH" until the amplitude displayed on the scope is minimum.
6. Repeat above steps 2 through 5 until the amplitude is minimum for both signals.

Clock adjustment (CLOCK)

Preparation:

Connect the frequency counter to TP017 (IC001 pin-79) and cold ground (⏚).

Note: *Frequency counter probe capacitance should be 8pF or less.*

Procedure:

1. Measure TP017 (IC001 pin-79) for the frequency of the waveform and record the reading.

Note: *Pin 13 measurement must have at least four digits of resolution following the decimal point. Example: 000.0000*

2. Place the receiver into service mode for making electronic adjustment, select the clock adjustment DAC "CLOCK".
3. Calculate and set "CLOCK" based on the following formula:

$$CLOCK = 128 + 450000\frac{732.4220 - pin79[\text{Hz}]}{732.4220}$$

Figure 39. CLOCK adjustment

Note: *Pin 13 measurement will not change regardless of the value stored in "CLOCK".*

Service adjustments (mechanical controls)

Focus (part of T551)

This adjustment is to make the picture clear

Preparation:

Connect a Signal generator and select a dot pattern.

Procedure:

Adjust the FOCUS controls to obtain the sharpest and clearest dot pattern.

a. Adjust VF1 to minimize width on vertical lines on corners.
b. Adjust VF2 to minimize width on horizontal lines on corners.

Audio signal path block diagram

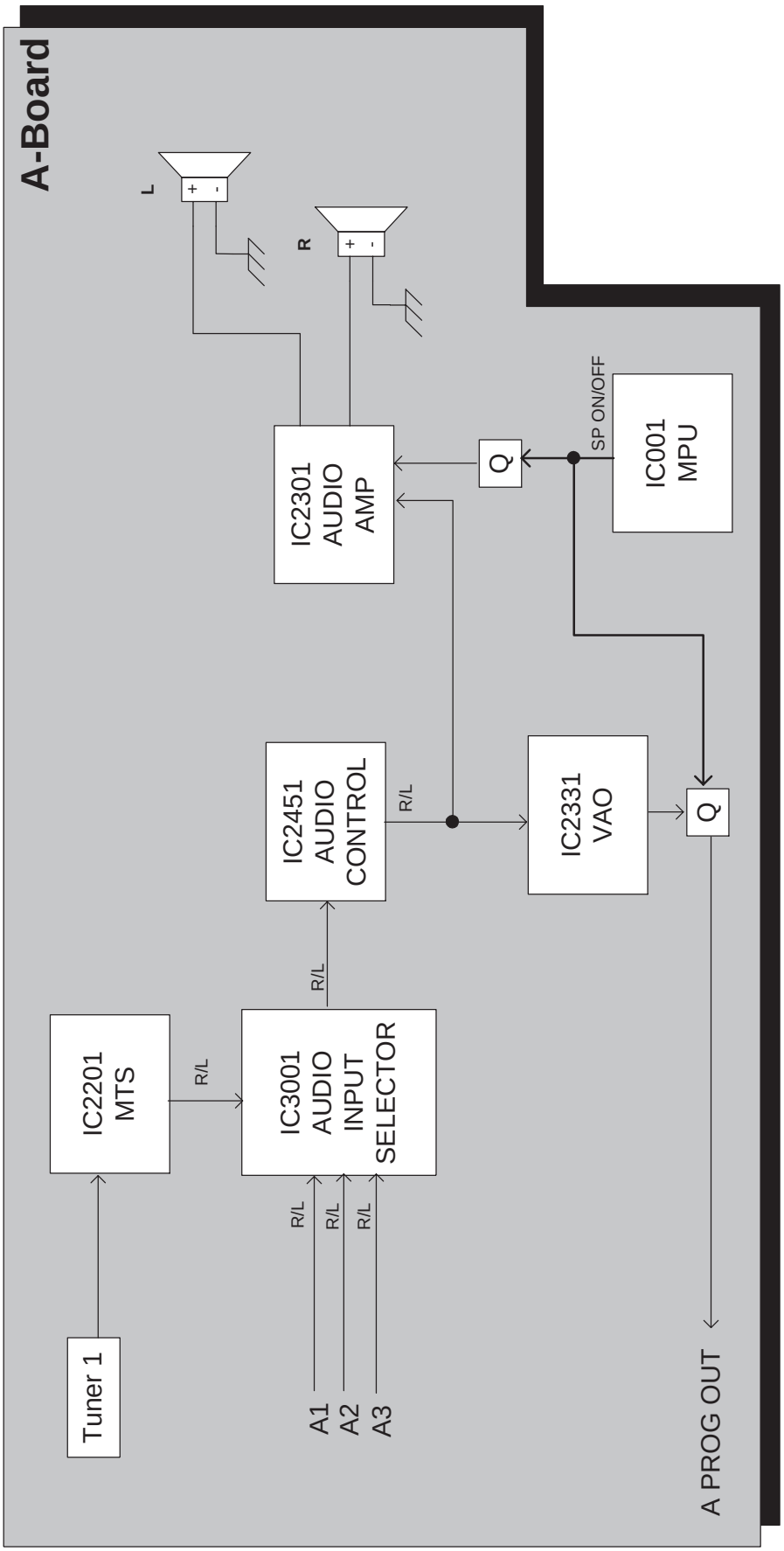


Figure 40. Audio signal path block diagram.

Video signal path block diagram

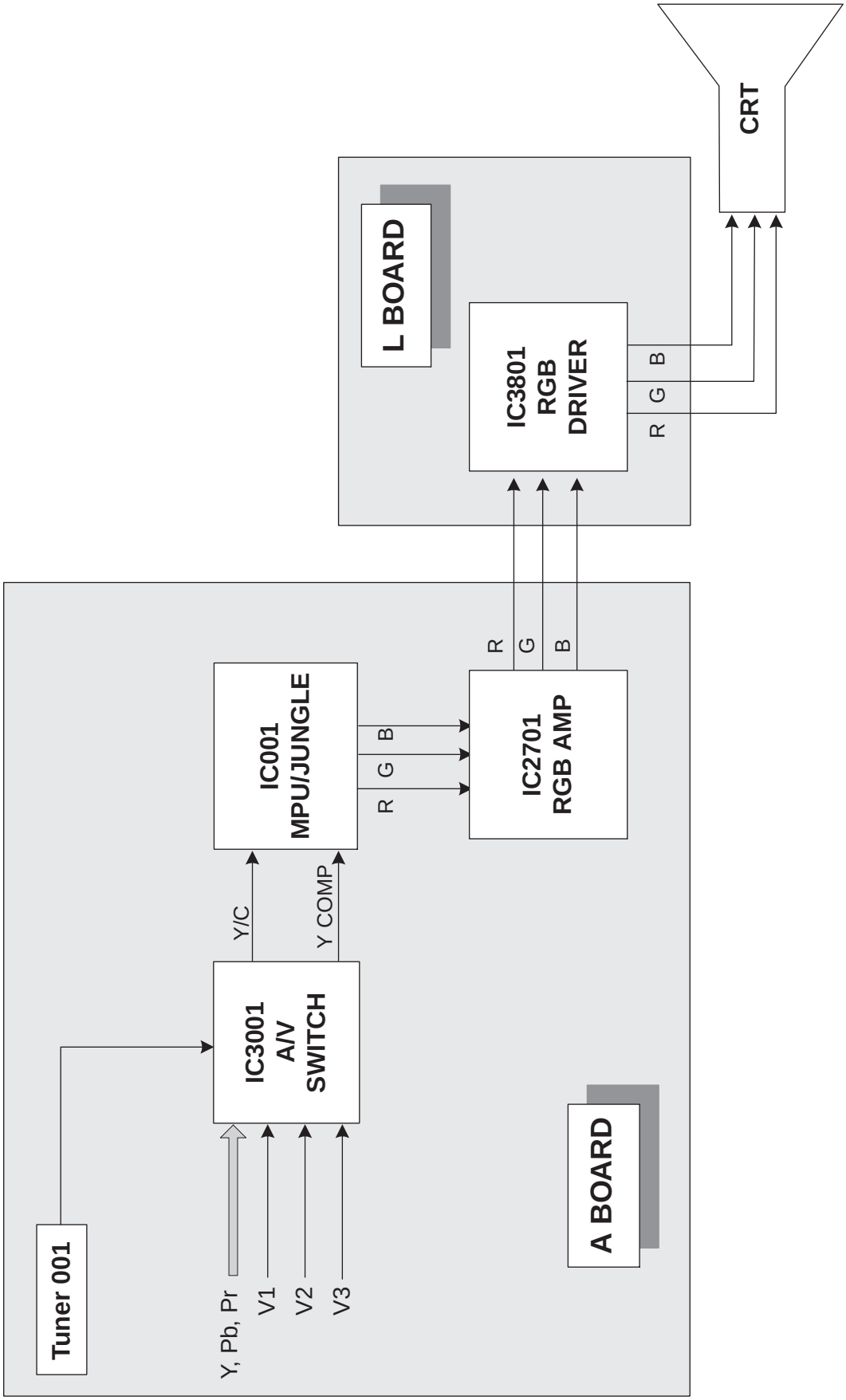


Figure 41. Video signal path block diagram.

Description of connectors

A15--DY	
1	VLD
2	N.C.
3	VHI

A16--A17	
1	30V
2	30V

D2--A8	
1	GND

D3--L11	
1	CRT GND

D4	HVDAF FBT

D5--A5	
1	POWER GND
2	POWER GND
3	UNREG 11V
4	UNREG 11V
5	BTL 30V
6	SIGNAL GND
7	STBY 12 V
8	SIGNAL GND
9	AC ON/OFF
10	DEG ON/OFF
11	SOS
12	SIGNAL GND
13	AUDIO 30V
14	AUDIO 30V
15	AUDIO GND
16	AUDIO GND

D6--A6	
1	EHT V
2	H DAF
3	EW
4	V RAMP
5	H DRIVE
6	H GND
7	SIGNAL GND
8	UNREG -15V
9	UNREG -15V
10	UNREG 15V
11	UNREG 15V
12	12V
13	SIGNAL GND
14	9V
15	UNREG 11V
16	UNREG 11V

D7--A7	
1	TUNER GND
2	TUNER GND
3	TUNER GND
4	TUNER GND
5	SIGNAL GND
6	SIGNAL GND
7	FOCUS PROTECT
8	HHS DET
9	FBP
10	ABL
11	SIGNAL GND
12	N.C.
13	SIGNAL GND
14	N.C.
15	SIGNAL GND
16	VSAW

G1--A1	
1	3.3V
2	RTM
3	KEY1
4	KEY2
5	GND
6	GND
7	N.C.
8	9V
9	12V
10	GND

G2--A2	
1	GND
2	SDA1
3	SCL1
4	GND
5	LANDING
6	HP MUTE
7	TILT
8	GND
9	S-3
10	C3

G3--A3	
1	Y3
2	L3
3	V3
4	R3
5	GND
6	GND
7	R_OUT
8	SP-GND
9	SP-GND
10	L-OUT

G4--SP	
1	L+
2	L-
3	R-
4	R+

G5--A13	
1	V3
2	GND
3	Y3
4	C3

G40--D40	
1	VSAW
2	GND
3	N.C.
4	GND
5	N.C.
6	GND
7	N.C.
8	+15V
9	GND
10	-15V

Description of connectors

L1--A14	
1	VM
2	GND
3	R
4	G
5	B
6	GND
7	12 V
8	GND

L2--VM COIL	
1	VM COIL
2	N.C.
3	VM COIL

L3--D1	
1	140 V
2	N.C.
3	210 V
4	N.C.
5	HEATER
6	N.C.
7	H-GND

L12	CRT GND

DEG--DEG COIL	
1	DEG 1
3	N.C.
5	DEG2

RT1	TILT COIL

RT4	LANDING COIL

TP1--BUS CON	
1	STNBY +B
2	FA1
3	FA2
4	SCL1
5	SDA1
6	SCL2
7	SDA2
8	RTM

Component identification

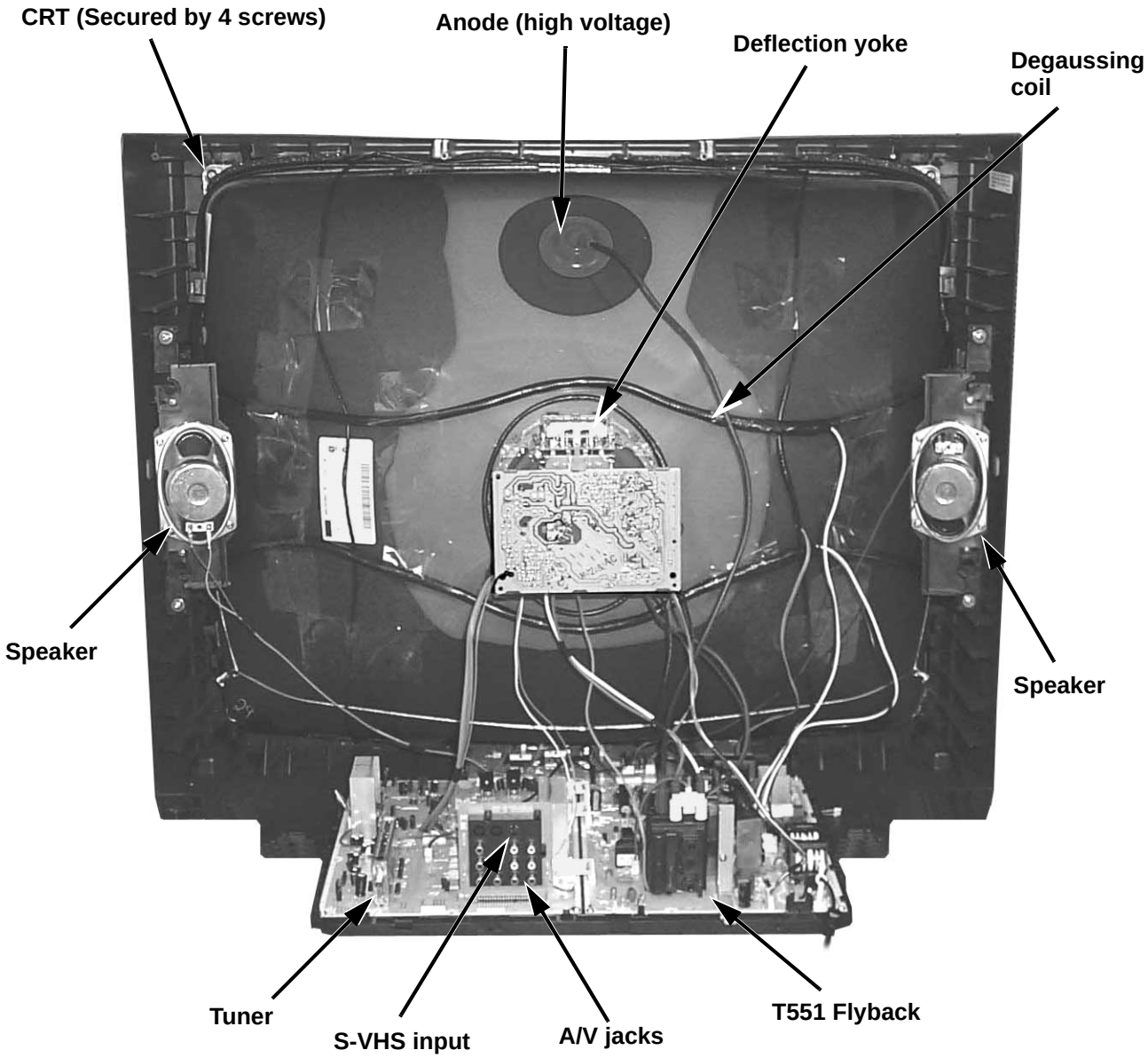


Figure 42. Rear view

Component identification

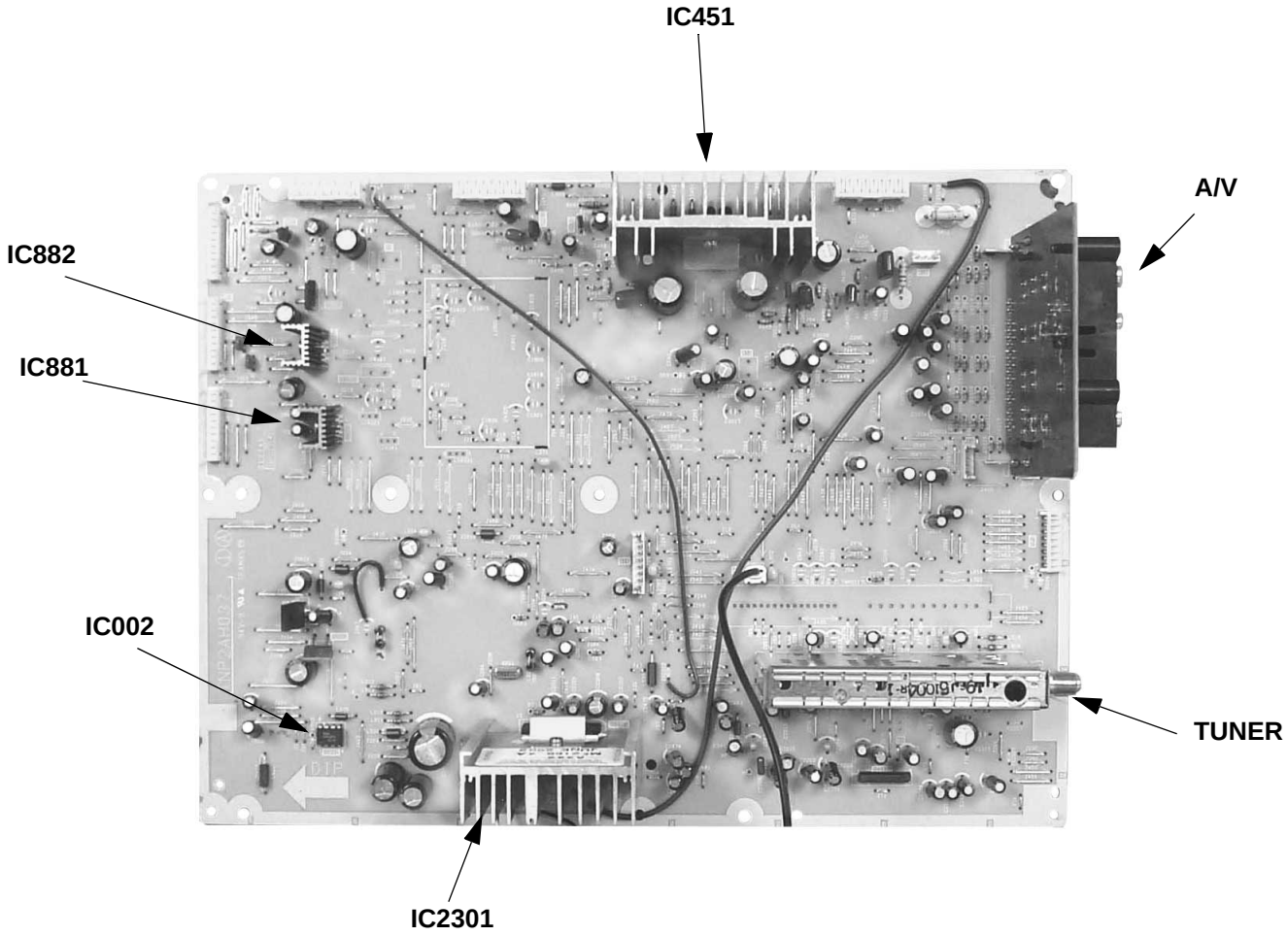


Figure 43. A-board

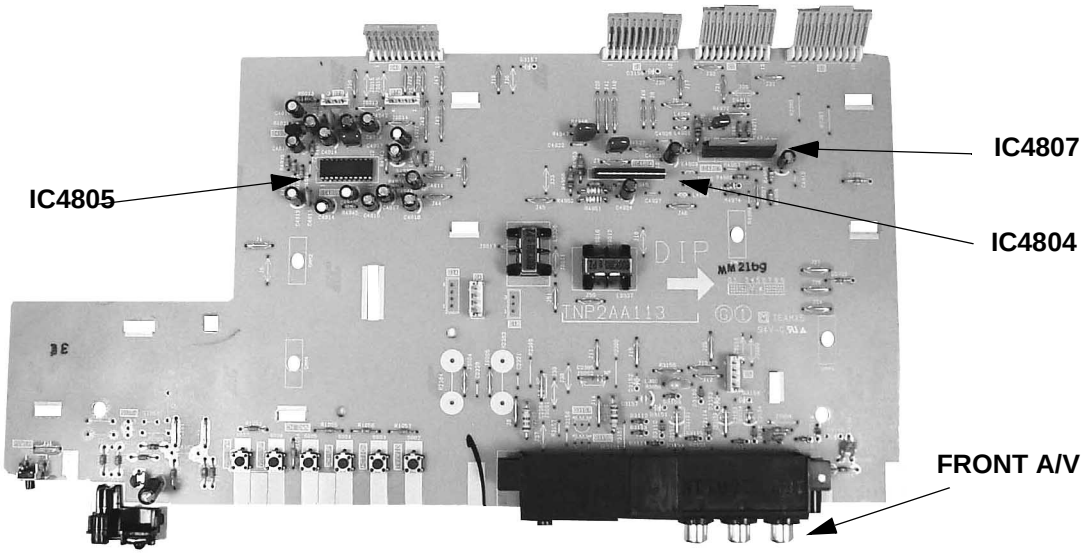


Figure 44. G-Board

Component identification

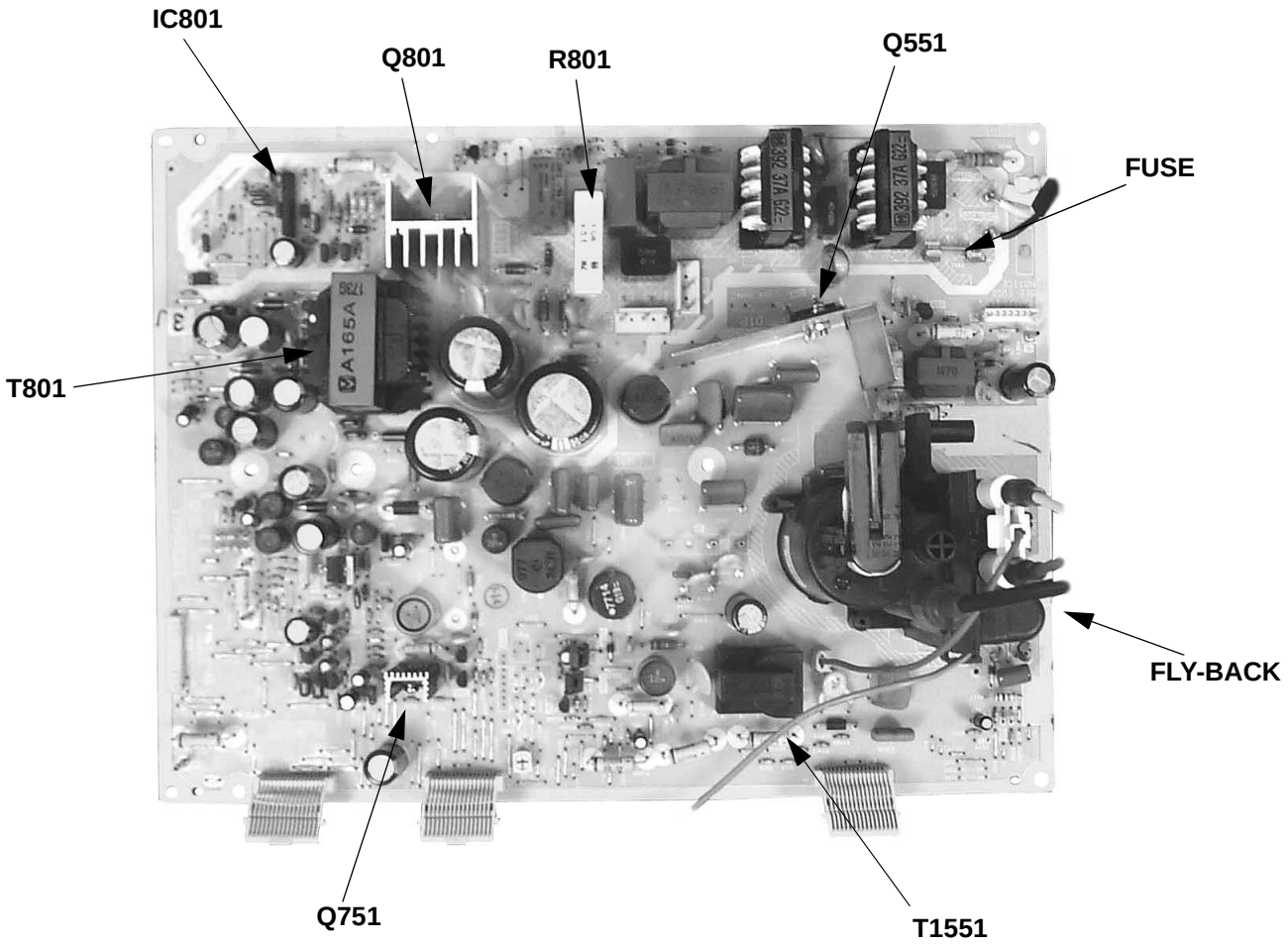


Figure 45. D-Board

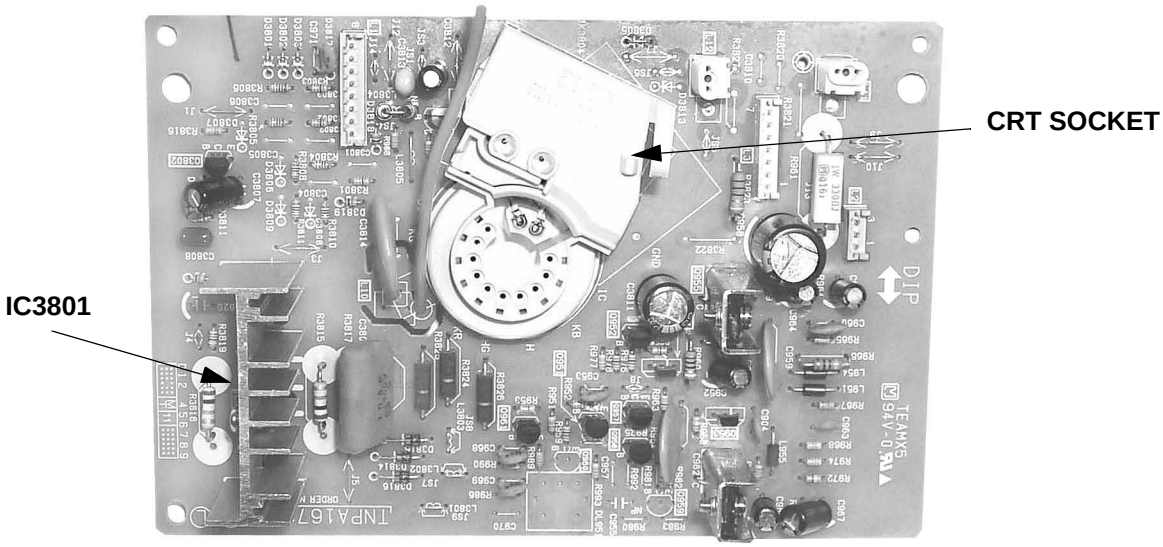


Figure 46. L-Board

REPLACEMENT PARTS LIST

Models: CT-32SX12F, CT-32SX12CF, CT-32SX12UF, CT-36SX12F, CT-36SX12CF, CT-36SX12UF.

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
		CAPACITORS
C008	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C009	TCJ2VC1H101J	CAP,C 100PF-J-50V
C010	TCJ2VC1H680J	CAP,C 68PF-J-50V
C011	TCJ2VC1H680J	CAP,C 68PF-J-50V
C012	ECA1HM220B	CAP,E 22UF-50V
C013	TCJ2VC1H680J	CAP,C 68PF-J-50V
C014	TCJ2VC1H390J	CAP,C 39PF-J-50V
C015	TCJ2VC1H120J	CAP,C 12PF-J-50V
C016	ECA1EM471B	CAP,E 470UF-25V
C017	TCJ2VC1H680J	CAP,C 68PF-J-50V
C018	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C020	ECA0JM221B	CAP,E 220UF-6.3V
C021	TCJ2VC1H101J	CAP,C 100PF-J-50V
C022	ECA1HM220B	CAP,E 22UF-50V
C028	TCJ2VB1H103K	CAP,C .01UF-K-50V
C030	TCJ2VB1H103K	CAP,C .01UF-K-50V
C031	TCJ2VC1H270J	CAP,C 27PF-J-50V
C032	ECA1HM101B	CAP,E 100UF-50V
C038	TCJ2VF1C105Z	CAP,C 1.0UF-Z-16V
C039	TCJ2VB1H221K	CAP,C 220PF-K-50V
C040	ECA0JM102B	CAP,E 1000UF-6.3V
C041	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C044	ECA1CM101B	CAP,E 100UF/16V
C046	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C048	TCJ2VF1C105Z	CAP,C 1.0UF-Z-16V
C051	TCJ2VF1C105Z	CAP,C 1.0UF-Z-16V
C052	ECA1CM101B	CAP,E 100UF/16V
C053	TCJ2VF1C105Z	CAP,C 1.0UF-Z-16V
C054	TCJ2VF1C105Z	CAP,C 1.0UF-Z-16V
C055	TCJ2VF1C105Z	CAP,C 1.0UF-Z-16V
C056	TCJ2VF1C105Z	CAP,C 1.0UF-Z-16V
C058	ECA1CM470B	CAP,E 47UF/16V
C059	TCJ2VF1C105Z	CAP,C 1.0UF-Z-16V
C060	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C061	ECA1HM100B	CAP,E 10UF/50V
C062	ECA1HM100B	CAP,E 10UF/50V
C063	TCJ2VF1C104Z	CAP,E .1UF-Z-16V
C064	ECA1CM101B	CAP,E 100UF/16V
C065	TCJ2VF1C104Z	CAP,E .1UF-Z-16V
C066	TCJ2VC1H330J	CAP,C 33PF-J-50V
C067	TCJ2VC1H680J	CAP,C 68PF-J-50V
C068	ECA1CM100B	CAP,E 10UF-16V
C069	TCJ2VB1H221K	CAP,C 220PF-K-50V
C070	TCJ2VF1C104Z	CAP,C .1UF-Z-16V
C071	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C075	ECA1HM2R2B	CAP,E 2.2UF-50V
C076	ECA1CM470B	CAP,E 47UF/16V
C077	ECA1HM100B	CAP,E 10UF/50V
C079	TCJ2VC1H270J	CAP,C 27PF-J-50V

REF NO.	PART NO.	DESCRIPTION
C080	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C083	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C085	TCJ2VB1C104K	CAP,C .1UF-K-16V
C401	TCJ2VB1H223K	CAP,C .022UF-K-50V
C403	ECA1CM220B	CAP,E 22UF-16V
C453	EEUNA1E220B	CAP,E 22UF-25V
C454	ECA1HHG221B	CAP,E 220UF-50V
C456	ECQB1104JF3	CAP,P .10UF-J-100V
C458	ECQB1H472JF3	CAP,P 4700PF-J-50V
C459	ECQB1224KF3	CAP,P .22UF-K-100V
C460	ECA1EM102E	CAP,E 1000UF-25V
C461	ECA1VM470B	CAP,E 47UF/35V
C462	ECA1EM222E	CAP,E 2200UF-25V
C463	ECQB1H103JF3	CAP,P .01UF-J-50V
C465	ECA1CM101B	CAP,E 100UF/16V
C470	ECQB1H104JF3	CAP,P .10UF-J-50V
C471	ECQB1H104JF3	CAP,P .10UF-J-50V
C495	ECQB1H683JF3	CAP,P .068UF-J-50V
C504	ECKR2H152KB5	CAP,C .0015UF-K-500V
C508	ECQB1H102JF3	CAP,P 1000PF-J-50V
C509	ECKR3A681KBP	CAP,C 680PF-K-1KV
C511	**ECWH20272JVY**	**CAP,P 2700PF-J-2KV** ***CT-32SX12F/CF/UF***
C511	**ECWH20332JVY**	**CAP,P 3300PF-J-2KV CT-36SX12F/CF/UF**
C512	ECKR2H332KB5	CAP,C 3300PF-K-550V
C513	**ECQF4153JZH**	**CAP,P .015UF-J-400V**
C514	**ECWH20133JVB**	**CAP,P 13000PF-J-2KV**
C518	**ECKW3D681KBR**	**CAP,C 680PF-K-2KV**
C519	**ECKW3D681KBR**	**CAP,C 680PF-K-2KV**
C520	**ECQB1H153JF3**	**CAP,P .015UF-J-50V**
C522	**ECKW3D471JBR**	**CAP,C 470PF-J-2KV**
C523	**ECWH20182JVY**	**CAP,P 1800PF-J-2KV CT-36SX12F/CF/UF**
C523	**ECWH20362JVY**	**CAP,P 3600PF-J-2KV CT-32SX12F/CF/UF**
C524	ECQB1224JF3	CAP,P .22UF-J-100V
C525	ECA1HMR22B	CAP,E .22UF-50V
C526	ECA2EM470E	CAP,E 47UF-250V
C527	ECKR2H102KB5	CAP,C 1000PF-K-500V
C528	**ECA1HM4R7B**	**CAP,E 4.7UF-50V**
C531	**ECA160V33UE**	**CAP,E 33UF/160V**
C532	**ECQF4273JZH**	**CAP,P .027UF-J-400V**
C553	ECWF2105JSR	CAP,P 1UF-J-200V
C560	ECEA1CN470UB	CAP,E 47UF-16V
C561	TCJ2VC1H102J	CAP,C .001UF-F-50V
C562	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C563	TCJ2VC1H102J	CAP,C .001UF-F-50V
C564	ECA1CM220B	CAP,E 22UF-16V
C565	ECEA1HN470UB	CAP,E 47UF-50V
C566	ECEA1CN470UB	CAP,E 47UF-16V

REPLACEMENT PARTS LIST

Models: CT-32SX12F, CT-32SX12CF, CT-32SX12UF, CT-36SX12F, CT-36SX12CF, CT-36SX12UF.

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
C567	TCJ2VC1H101J	CAP,C 100PF-J-50V
C568	ECA1EM471B	CAP,E 470UF-25V
C569	ECWF2244JSR	CAP,M .22UF-J-200V
C572	ECWF2474JSR	CAP,P .47UF-J-200V
C573	ECQE2474KFB	CAP,P .47UF-K-200V
C574	ECA1HM470B	CAP,E 47UF-50V *CT-36SX12F/CF/UF*
C575	ECQV1H334JL3	CAP,P .33UF-J-50V *CT-36SX12F/CF/UF*
C591	ECA1HM010B	CAP,E 1UF-50V
C592	TCJ2VF1E224Z	CAP,C .22UF-Z-25V
C593	ECA1CM470B	CAP,E 47UF/16V
C751	ECQE1335KFB	CAP,P 3.3UF-K-100V
C756	ECKR2H332KB5	CAP,C 3300PF-K-550V
C763	ECKR3A121KBP	CAP,C 120PF-K-1KV
C801	**ECQU2A224BN9**	**CAP,P .22UF-B-250V**
C802	**ECQU2A823BN9**	**CAP,P .082UF-B-250V**
C803	ECQB1H222JF3	CAP,P 2200PF-J-50V
C804	**EC0S2DA821CB**	**CAP,E 820UF-200V**
C805	**ECKW2H472PU7**	**CAP,C 4700PF-P-500V**
C806	**ECKW2H472PU7**	**CAP,C 4700PF-P-500V**
C807	**ECKW2H472PU7**	**CAP,C 4700PF-P-500V**
C808	**ECKW2H472PU7**	**CAP,C 4700PF-P-500V**
C809	ECQB1H333JF3	CAP,P .033UF-J-50V
C810	ECQB1H102JF3	CAP,P 1000PF-J-50V
C811	**EC0S2DA821CB**	**OR EC0S2DA821DB**
C815	ECA1EM471B	CAP,E 470UF-25V
C817	ECQB1H332JF3	CAP,P 3300PF-J-50V
C819	TACCQ221T50V	CAP,C 220PF/50V
C820	ECA1EHG471B	CAP,E 470UF-25V
C821	ECKW3D222KBP	CAP,C 2200UF-K-2KVDC
C822	ECQB1H393JF3	CAP,P .039UF-J-50V
C826	ECA1CM222E	CAP,E 2200UF-16V
C827	ECQB1H333JF3	CAP,P .033UF-J-50V
C829	ECA1HHG102E	CAP,E 1000UF-50V
C830	**EC0S2CA102CB**	**CAP,E 1000UF-160V**
C831	ECKR3A102KBP	CAP,C 1000PF-K-1KV
C832	ECA1CM332E	CAP,E 3300UF-16V
C833	ECKR3A471KBP	CAP,C 470PF-K-1KV
C834	ECA1CM332E	CAP,E 3300UF-16V
C836	ECKR3A331KBP	CAP,C 330PF-K-1KVDC
C837	ECA1EM222E	CAP,E 2200UF-25V
C839	ECKR3A151KBP	CAP,C 150PF-K-1KV
C840	ECA1EM222E	CAP,E 2200UF-25V
C841	ECA1EM222E	CAP,E 2200UF-25V
C842	ECKR3A331KBP	CAP,C 330PF-K-1KVDC
C843	ECA1VM102E	CAP,E 1000UF-35V
C844	ECKR3A471KBP	CAP,C 470PF-K-1KV
C845	ECA1CM101B	CAP,E 100UF/16V
C846	ECA1HM010B	CAP,E 1UF-50V
C848	ECA1CM101B	CAP,E 100UF/16V
C852	**ECKCNA222MEB**	**CAP,C 2200PF-M-250V**

REF NO.	PART NO.	DESCRIPTION
C854	**ECKCNA222MEB**	**CAP,C 2200PF-M-250V**
C881	ECA1CM101B	CAP,E 100UF/16V
C883	ECA1CM101B	CAP,E 100UF/16V
C885	ECA1CM471B	CAP,E 470UF-16V
C886	ECA1CM471B	CAP,E 470UF-16V
C888	ECA1EM471B	CAP,E 470UF-25V
C889	ECA1CM221B	CAP,E 10UF-16V
C895	ECA1EM101B	CAP,E 100UF-25V
C901	TCJ2VB1H103K	CAP,C .01UF-K-50V
C904	ECKR1H103ZF5	CAP,C .01UF-Z-50V
C952	ECA1HM100B	CAP,E 10UF/50V
C953	ECKR1H103ZF5	CAP,C .01UF-Z-50V
C958	ECA2CM470E	CAP,E 47UF-160V
C959	ECKW2H103KB5	CAP,C .01UF-K-500V
C960	ECCR2H151J5	CAP,C 150-500V
C961	ECA2AM100B	CAP,E 10UF-100V
C962	ECKW2H103KB5	CAP,C .01UF-K-500V
C963	ECCR1H151J5	CAP DISC 150-5-50V
C964	ECA1CHG101B	CAP,E 100UF-16V
C966	ECA1CHG101B	CAP,E 100UF-16V
C967	ECA1CM221B	CAP,E 10UF-16V
C968	ECKR1H103ZF5	CAP,C .01UF-Z-50V
C969	ECKR1H103ZF5	CAP,C .01UF-Z-50V
C971	ECKR1H222KB5	CAP,C 2200PF-K-50V
C1051	TACCX103T50V	CAP,C .01UF/50V
C1052	ECA1HM470B	CAP,E 47UF-50V
C1556	ECA1CM470B	CAP,E 47UF/16V
C1559	ECQB1H333JF3	CAP,P .033UF-J-50V
C1560	ECA1HM100B	CAP,E 10UF/50V
C1561	ECA1HM010B	CAP,E 1UF-50V
C1562	ECQM4223KZW	CAP,P .022UF-K-400V
C1563	ECKW3D102KBR	CAP,C 1000PF-K-2KV
C1564	ECKR3A471KBP	CAP,C 470PF-K-1KV
C1566	ECA1CM221B	CAP,E 10UF-16V
C1567	ECQB1H104JF3	CAP,P .10UF-J-50V
C1568	ECQB1H104JF3	CAP,P .10UF-J-50V
C1570	ECA1HM2R2B	CAP,E 2.2UF-50V
C1571	ECKR2H471KB5	CAP,C 470PF-K-500W
C1572	ECKW3A332KBP	CAP,C 3300PF-K-1KV
C1575	TACCV101T50V	CAP,C 100PF/50V
C1577	ECKR2H471KB5	CAP,C 470PF-K-500W
C1578	ECQM4223KZW	CAP,P .022UF-K-400V
C1580	ECKW3A471KBP	CAP,C 470PF-K-1KV
C2202	ECA1HM2R2B	CAP,E 2.2UF-50V
C2203	ECA1HM4R7B	CAP,E 4.7UF-50V
C2204	AP106K016CAE	CAP,T 10UF/16V
C2205	ECA1HM010B	CAP,E 1UF-50V
C2206	ECQB1H223JF3	CAP,P .022UF-J-50V
C2207	AP335K016CAE	CAP,T 3.3UF/16V
C2208	TCJ2VB1C104K	CAP,C .1UF-K-16V

REPLACEMENT PARTS LIST

Models: CT-32SX12F, CT-32SX12CF, CT-32SX12UF, CT-36SX12F, CT-36SX12CF, CT-36SX12UF.

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
C2209	TCJ2VB1C104K	CAP,C .1UF-K-16V
C2210	TCJ2VB1C104K	CAP,C .1UF-K-16V
C2211	ECA1CM100B	CAP,E 10UF-16V
C2212	ECQB1H473JF3	CAP,P .047UF-J-50V
C2215	ECA0JM101B	CAP,E 100UF-6.3V
C2218	ECA1HMR47B	CAP,E .47UF-50V
C2219	TCJ2VC1H100D	CAP,C 10PF-J-50V
C2302	ECA1HM010B	CAP,E 1UF-50V
C2303	TCJ2VB1H392K	CAP,C 3900UF-K-50V
C2304	TCJ2VB1H392K	CAP,C 3900UF-K-50V
C2305	ECA1HM010B	CAP,E 1UF-50V
C2307	ECA1EM102E	CAP,E 1000UF-25V
C2308	ECA1HM101B	CAP,E 100UF-50V
C2311	ECA1HM010B	CAP,E 1UF-50V
C2312	ECA1EM102E	CAP,E 1000UF-25V
C2313	ECA1VM222E	CAP,E 2200UF-35V
C2314	ECA1EM102E	CAP,E 1000UF-25V
C2331	ECA1HM010B	CAP,E 1UF-50V
C2332	ECA1HM010B	CAP,E 1UF-50V
C2333	ECA1EM100B	CAP,E 10UF-25V
C2334	ECA1EM100B	CAP,E 10UF-25V
C2335	ECA1HM010B	CAP,E 1UF-50V
C2336	ECA1HM010B	CAP,E 1UF-50V
C2337	ECA1CM470B	CAP,E 47UF/16V
C2350	ECA1CM101B	CAP,E 100UF/16V
C2431	TCJ2VF1C105Z	CAP,C 1.0UF-Z-16V
C2432	TCJ2VF1C105Z	CAP,C 1.0UF-Z-16V
C2433	TCJ2VC1H222J	CAP,C 2200PF-J-50V
C2437	TCJ2VB1H333K	CAP,C .033UF-K-50V
C2438	TCJ2VB1H102K	CAP,C 1000PF-K-50V
C2444	TCJ2VB1C104K	CAP,C .1UF-K-16V
C2445	TCJ2VB1C104K	CAP,C .1UF-K-16V
C2449	TCJ2VB1H333K	CAP,C .033UF-K-50V
C2450	TCJ2VB1H102K	CAP,C 1000PF-K-50V
C2451	ECEA1CN100UB	CAP,E 10UF-16V
C2452	TCJ2VB1H103K	CAP,C .01UF-K-50V
C2459	TCJ2VB1H333K	CAP,C .033UF-K-50V
C2460	TCJ2VB1H333K	CAP,C .033UF-K-50V
C2461	ECA1HM4R7B	CAP,E 4.7UF-50V
C2462	ECA1HM4R7B	CAP,E 4.7UF-50V
C2463	ECEA1CN100UB	CAP,E 10UF-16V
C2464	TCJ2VB1H333K	CAP,C .033UF-K-50V
C2465	TCJ2VB1H333K	CAP,C .033UF-K-50V
C2468	ECA1CM101B	CAP,E 100UF/16V
C2473	ECA1HM4R7B	CAP,E 4.7UF-50V
C2474	ECA1CM101B	CAP,E 100UF/16V
C2475	ECA1HM4R7B	CAP,E 4.7UF-50V
C2501	TCJ2VC1H680J	CAP,C 68PF-J-50V
C2502	TCJ2VC1H680J	CAP,C 68PF-J-50V
C2503	TCJ2VC1H680J	CAP,C 68PF-J-50V

REF NO.	PART NO.	DESCRIPTION
C2504	ECEA1CN100UB	CAP,E 10UF-16V
C2505	ECEA1CN101UB	CAP,E 100UF-16V
C2505	EEANA1E100B	CAP,E 10UF-25V
C2506	ECEA1CN101UB	CAP,E 100UF-16V
C2701	ECA1CM101B	CAP,E 100UF/16V
C2702	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C3001	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C3002	ECA1CM101B	CAP,E 100UF/16V
C3003	ECA1CM100B	CAP,E 10UF-16V
C3004	ECA1CM100B	CAP,E 10UF-16V
C3005	ECA1CM100B	CAP,E 10UF-16V
C3006	ECA1HM010B	CAP,E 1UF-50V
C3007	ECA1HM010B	CAP,E 1UF-50V
C3008	ECA1CM100B	CAP,E 10UF-16V
C3009	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C3010	ECA1CM100B	CAP,E 10UF-16V
C3011	ECA1HM010B	CAP,E 1UF-50V
C3012	ECA1HM010B	CAP,E 1UF-50V
C3013	ECA1CM100B	CAP,E 10UF-16V
C3014	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C3015	ECA1HM010B	CAP,E 1UF-50V
C3016	ECA1HM010B	CAP,E 1UF-50V
C3018	ECA1HM010B	CAP,E 1UF-50V
C3019	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C3020	ECEA1CN100UB	CAP,E 10UF-16V
C3021	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C3022	ECA1CM101B	CAP,E 100UF/16V
C3023	ECA1HM010B	CAP,E 1UF-50V
C3024	ECA1HM010B	CAP,E 1UF-50V
C3025	ECA1CM100B	CAP,E 10UF-16V
C3054	ECA1CM471B	CAP,E 470UF-16V
C3158	ECKR1H152KB5	CAP,C 1500PF-K-50V
C3159	ECKR1H152KB5	CAP,C 1500PF-K-50V
C3807	ECA1CM221B	CAP,E 10UF-16V
C3808	ECQV1H224JL3	CAP,P .22UF-J-50V
C3809	ECQM4104KZB	CAP,P .10UF-K-400V
C3811	ECA2EM100B	CAP,E 10UF/250V
C3812	ECEA1CN100UB	CAP,E 10UF-16V
C3814	ECKC3D332KBN	CAP,C 3300PF-K-2KV
C4810	ECEA1CN220UB	CAP,E 22UF-16V
C4811	ECEA1HN2R2UB	CAP,E 2.2UF-50V
C4812	ECA1HM0R1B	CAP,E 0.1UF/50V
C4813	ECKR1H472KB5	CAP,C 4700PF-K-50V
C4814	ECA1HM4R7B	CAP,E 4.7UF-50V
C4815	ECA1HM4R7B	CAP,E 4.7UF-50V
C4816	ECA1HM4R7B	CAP,E 4.7UF-50V
C4817	ECA1HMR47B	CAP,E .47UF-50V
C4818	ECA1EM100B	CAP,E 10UF-25V
C4819	ECEA1CN100UB	CAP,E 10UF-16V
C4910	ECA1VM470B	CAP,E 47UF/35V

REPLACEMENT PARTS LIST

Models: CT-32SX12F, CT-32SX12CF, CT-32SX12UF, CT-36SX12F, CT-36SX12CF, CT-36SX12UF.

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
C4911	ECQV1H334JL3	CAP,P .33UF-J-50V
C4913	ECEA1CN100UB	CAP,E 10UF-16V
C4914	ECA1HM0R1B	CAP,E 0.1UF/50V
C4915	ECKR1H472KB5	CAP,C 4700PF-K-50V
C4916	ECA1CM470B	CAP,E 47UF/16V
C4917	ECQB1H104JF3	CAP,P .10UF-J-50V
C4918	ECA1HM0R1B	CAP,E 0.1UF/50V
C4919	ECA1HM4R7B	CAP,E 4.7UF-50V
C4920	ECKR1H103ZF5	CAP,C .01UF-Z-50V
C4921	ECA1CM470B	CAP,E 47UF/16V
C4922	ECQB1H104JF3	CAP,P .10UF-J-50V
C4923	ECA1VM470B	CAP,E 47UF/35V
C4924	ECA1VM470B	CAP,E 47UF/35V
C4925	ECQB1H104JF3	CAP,P .10UF-J-50V
		DIODES
D006	MA4300HTA	DIODE
D007	MA4030HTA	DIODE
D451	B0EAKM000018	DIODE
D455	MA165TA5VT	DIODE, SWITCHING
D456	MA165TA5VT	DIODE, SWITCHING
D457	MA165TA5VT	DIODE, SWITCHING
D459	MA165TA5VT	DIODE, SWITCHING
D504	MA4300LTA	DIODE
D507	MA4082LTA	DIODE
D509	MA165TA5VT	DIODE, SWITCHING
D510	MA4051MTA	DIODE, ZENER
D511	D1NL40V70	DIODE
D512	**D1NL40V70**	**DIODE**
D551	ERD07-15E	DIODE
D552	RU3NLFA1	DIODE
D561	MA165TA5VT	DIODE, SWITCHING *CT-36SX12F/CF/UF*
D562	MA165TA5VT	DIODE, SWITCHING *CT-36SX12F/CF/UF*
D563	MA4030HTA	DIODE
D753	AU01ZV0	DIODE
D801	**RM10BLFA1**	**DIODE**
D802	**RM10BLFA1**	**DIODE**
D803	**RM10BLFA1**	**DIODE**
D804	**RM10BLFA1**	**DIODE**
D805	MA700ATA	DIODE
D806	AU01ZV0	DIODE
D808	**D4DDF1R50001**	**DIODE**
D813	MA165TA5VT	DIODE, SWITCHING
D814	MA178TA5	DIODE
D815	MA165TA5VT	DIODE, SWITCHING
D816	MA165TA5VT	DIODE, SWITCHING
D817	MA165TA5VT	DIODE, SWITCHING
D818	MA4200MTA	DIODE
D819	MA178TA5	DIODE
D820	B0EAKL000008	DIODE, RECTIFIER
D821	B0EAKL000008	DIODE, RECTIFIER
D822	B0EAKL000008	DIODE, RECTIFIER
D823	B0EAKL000008	DIODE, RECTIFIER
D824	**TMPG10G3**	**DIODE**
D825	**RU30ALFS1**	**DIODE, RECTIFIER**
D826	AU02ZV0	DIODE
D827	RU3YX-MV1	DIODE, RECTIFIER
D828	S2L20UP1518	DIODE
D829	S2L20UP1518	DIODE
D830	RU3YX-MV1	DIODE, RECTIFIER
D832	MA165TA5VT	DIODE, SWITCHING
D834	AU02ZV0	DIODE
D835	MA165TA5VT	DIODE, SWITCHING
D836	MA4180MTA	DIODE
D837	MA165TA5VT	DIODE, SWITCHING
D841	MA165TA5VT	DIODE, SWITCHING
D861	TVSA81004V3	DIODE
D862	TVSA81004V3	DIODE
D876	MA165TA5VT	DIODE, SWITCHING
D877	MA165TA5VT	DIODE, SWITCHING
D881	MA165TA5VT	DIODE, SWITCHING
D1001	LN81RPHCF3	DIODE
D1551	B0AAGR000002	DIODE
D1552	MA165TA5VT	DIODE, SWITCHING
D1553	RP1HLFA5	DIODE
D1557	MA165TA5VT	DIODE, SWITCHING
D1558	MA165TA5VT	DIODE, SWITCHING
D2301	MA4360HTA	DIODE, ZENER
D2302	MA165TA5VT	DIODE, SWITCHING
D2303	MA165TA5VT	DIODE, SWITCHING
D2305	MA4110MTA	DIODE, ZENER
D2306	MA4110MTA	DIODE, ZENER
D2307	MA4110MTA	DIODE, ZENER
D2308	MA4110MTA	DIODE, ZENER
D2309	MA4110MTA	DIODE, ZENER
D2310	MA4110MTA	DIODE, ZENER
D2311	MA4110MTA	DIODE, ZENER
D2312	MA4110MTA	DIODE, ZENER
D2320	MA4390MTA	DIODE
D2321	MA4390MTA	DIODE
D3001	MA4110MTA	DIODE, ZENER
D3002	MA4110MTA	DIODE, ZENER
D3003	MA4110MTA	DIODE, ZENER
D3004	MA4110MTA	DIODE, ZENER
D3005	MA4110MTA	DIODE, ZENER
D3006	MA4110MTA	DIODE, ZENER
D3007	MA4110MTA	DIODE, ZENER
D3008	MA4110MTA	DIODE, ZENER
D3009	MA4110MTA	DIODE, ZENER
D3010	MA4110MTA	DIODE, ZENER

REPLACEMENT PARTS LIST

Models: CT-32SX12F, CT-32SX12CF, CT-32SX12UF, CT-36SX12F, CT-36SX12CF, CT-36SX12UF.

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
D3011	MA4110MTA	DIODE, ZENER
D3012	MA4110MTA	DIODE, ZENER
D3017	MA4110MTA	DIODE, ZENER
D3018	MA4110MTA	DIODE, ZENER
D3019	MA4110MTA	DIODE, ZENER
D3020	MA4110MTA	DIODE, ZENER
D3051	MA4110MTA	DIODE, ZENER
D3110	MA4110MTA	DIODE, ZENER
D3111	MA4110MTA	DIODE, ZENER
D3112	MA4110MTA	DIODE, ZENER
D3113	MA4110MTA	DIODE, ZENER
D3114	MA4110MTA	DIODE, ZENER
D3115	MA4110MTA	DIODE, ZENER
D3116	MA4110MTA	DIODE, ZENER
D3117	MA4110MTA	DIODE, ZENER
D3118	MA4110MTA	DIODE, ZENER
D3119	MA4110MTA	DIODE, ZENER
D3159	MA4110MTA	DIODE, ZENER
D3160	MA4110MTA	DIODE, ZENER
D3801	MA165TA5VT	DIODE, SWITCHING
D3802	MA165TA5VT	DIODE, SWITCHING
D3803	MA165TA5VT	DIODE, SWITCHING
D3804	MA165TA5VT	DIODE, SWITCHING
D3812	MA4150MTA	DIODE
D3814	B0AAGP000003	DIODE, RECEIVER
D3815	B0AAGP000003	DIODE, RECEIVER
D3816	B0AAGP000003	DIODE, RECEIVER
D3817	MA4150MTA	DIODE
D3818	MA4150MTA	DIODE
D3819	MA4150MTA	DIODE
D4810	MA165TA5VT	DIODE, SWITCHING
D4811	MA165TA5VT	DIODE, SWITCHING
D4812	MA4150MTA	DIODE
D4813	MA4150MTA	DIODE
		FUSES
F801	**XBA2A00101**	**FUSE 6.3A 125V**
		INTEGRATED CIRCUITS
IC001	MN102H81GTB7	MPU/SYNC SEPA/COMB/VCO
IC002	TVR2AJ145S	EEPROM
IC003	AN78M05LB	PLUS 5V AVR
IC004	PST9128NR	RESET
IC005	PQ3RD13B	REGULATOR 3.3V
IC451	LA78045	VERTICAL OUT
IC510	TC74HC221AF	INT CKT
IC511	AN6914S-E1	FOCUS SHORT PROTECTER *CT-36SX12F/CF/UF*
IC801	**AN8029**	**MAIN POWER REGULATOR**
IC802	**SE139NLF4**	**ERROR AMPLIFIER**
IC811	**PC123FY2**	**OPTO COUPLER**
IC881	AN7805LB	MAIN 5V
IC882	AN7809LB	MAIN 9V

REF NO.	PART NO.	DESCRIPTION
IC883	PQ12RD1B	MAIN 12V
IC2201	AN5849S-E1V	MTS
IC2301	AN5277	AUDIO OUT
IC2331	NJM4565L	VAO
IC2451	BH3868CFS-E2	SOUND PROCESSOR
IC2701	AN15931A-E1	RGB AMP
IC3001	AN15851A-E1	A/V SWITCH
IC3801	TDA6103Q-N3	RGB DRIVER
IC4804	LA6510	TILT CORRECTION
IC4805	C1AA00000163	H TRAPEZOID CONTROL
IC4807	LA6510	LANDING CORRECTION
RM001	PNA4701M04TV	IR-REMOTE SENSOR
		COILS
LC001	EXCEMT471BTS	EMI FILTER
LC002	EXCEMT471BTS	EMI FILTER
L001	EXCELSA26T	FERRITE BEAD
L002	ELESN180JA	COIL, PEAKING 18UH
L003	ELESN330JA	COIL, PEAKING 33UH
L004	ELESN330JA	COIL, PEAKING 33UH
L006	EXCELSA24T	FERRITE BEAD
L007	ELESN330JA	COIL, PEAKING 33UH
L008	ELESN470JA	COIL, PEAKING 47UH
L009	EXCELSA26T	FERRITE BEAD
L010	TLTABT2R2K	COIL, PEAKING 2.2UH
L011	TLTABT2R2K	COIL, PEAKING 2.2UH
L012	TLTABT2R2K	COIL, PEAKING 2.2UH
L013	TLTABT2R2K	COIL, PEAKING 2.2UH
L015	TLTABT2R2K	COIL, PEAKING 2.2UH
L016	TLTABT2R2K	COIL, PEAKING 2.2UH
L017	ELESN330JA	COIL, PEAKING 33UH
L020	EXCELSA35V	FERRITE BEAD
L022	EXCELDR35V	FERRITE BEAD
L026	EXCELSA35T	FERRITE BEAD
L030	EXCELSA39V	FERRITE BEAD
L071	ELESN150JA	COIL, PEAKING 15UH
L205	EXCELSA35T	FERRITE BEAD
L402	EXCELSA39V	FERRITE BEAD
L551	**ELH5L7722**	**COIL**
L553	**ELHKLB077B**	**COIL**
L555	EXCELSA35T	FERRITE BEAD
L556	ELC18B801E	COIL
L559	TLUADNB682K	COIL
L706	EXCELSA26T	FERRITE BEAD
L751	ELC18B801E	COIL
L752	TALFP15B103K	LINE FILTER
L801	**ELF21N030A**	**LINE FILTER**
L802	**ELF21N030A**	**LINE FILTER**
L807	TSKA064-1	FERRITE BEAD
L812	EXCELSA26T	FERRITE BEAD
L814	TALL08T101KA	LINE FILTER

REPLACEMENT PARTS LIST

Models: CT-32SX12F, CT-32SX12CF, CT-32SX12UF, CT-36SX12F, CT-36SX12CF, CT-36SX12UF.

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
L815	EXCELSA39E	FERRITE BEAD
L816	EXCELSA39E	FERRITE BEAD
L817	EXCELDR35V	FERRITE BEAD
L818	EXCELDR35V	FERRITE BEAD
L819	EXCELSA24T	FERRITE BEAD
L820	EXCELSA24T	FERRITE BEAD
L821	EXCELDR35V	FERRITE BEAD
L824	EXCELDR35V	FERRITE BEAD
L825	TLUADTB121K	COIL
L826	TLUADTB820K	COIL
L827	TALL08T470KA	COIL
L850	ELESN101JA	COIL, PEAKING 100UH
L851	TLUADTB121K	COIL
L951	EXCELSA24T	FERRITE BEAD
L953	EXCELSA24T	FERRITE BEAD
L954	EXCELSA24T	FERRITE BEAD
L955	EXCELSA24T	FERRITE BEAD
L1551	TALL13N103JB	COIL
L2305	EXCELSA26T	FERRITE BEAD
L2701	ELESN150JA	COIL, PEAKING 15UH
L3001	ELESN560JA	COIL, PEAKING 56UH
L3804	ELESN390JA	COIL, PEAKING 39UH
L3805	EXCELSA24T	FERRITE BEAD
	TRANSISTORS	
Q009	2SD601ARTX	TRANSISTOR
Q019	2SD601ARTX	TRANSISTOR
Q021	2SB709ARTX	TRANSISTOR
Q022	2SB709ARTX	TRANSISTOR
Q023	2SB709ARTX	TRANSISTOR
Q024	2SD601ARTX	TRANSISTOR
Q302	2SB709ARTX	TRANSISTOR
Q401	2SB709ARTX	TRANSISTOR
Q402	2SD601ARTX	TRANSISTOR
Q453	2SD601ARTX	TRANSISTOR
Q480	2SA1309ATA	TRANSISTOR
Q501	2SC3941RTA	TRANSISTOR
Q502	2SD601ARTX	TRANSISTOR
Q503	2SD601ARTX	TRANSISTOR
Q504	2SD601ARTX	TRANSISTOR
Q505	2SC1685QRSTA	TRANSISTOR
Q506	2SC1685QRSTA	TRANSISTOR
Q551	2SC5517000LK	TRANSISTOR
Q563	2SC3941RTA	TRANSISTOR *CT-36SX12F/CF/UF*
Q591	2SD601ARTX	TRANSISTOR
Q751	B1DACM000001	TRANSISTOR
Q756	2SC1685QRSTA	TRANSISTOR
Q757	2SC1685QRSTA	TRANSISTOR
Q801	2SK2759F217R	TRANSISTOR
Q802	2SC1685QRSTA	TRANSISTOR
Q803	2SC1685QRSTA	TRANSISTOR

REF NO.	PART NO.	DESCRIPTION
Q804	2SA564AQRSTA	TRANSISTOR
Q854	2SA19610QAHW	TRANSISTOR
Q881	2SC1685QRSTA	TRANSISTOR
Q882	2SB709ARTX	TRANSISTOR
Q883	2SB709ARTX	TRANSISTOR
Q901	2SD601ARTX	TRANSISTOR
Q951	2SC1685QRSTA	TRANSISTOR
Q952	2SC1685QRSTA	TRANSISTOR
Q953	2SC1741ASTP	TRANSISTOR
Q954	2SB1030ATA	TRANSISTOR
Q955	2SB1569AF51E	TRANSISTOR
Q956	2SD2400AF51E	TRANSISTOR
Q957	2SA564AQRSTA	TRANSISTOR
Q958	2SC1685QRSTA	TRANSISTOR
Q961	2SC1685QRSTA	TRANSISTOR
Q962	2SC1685QRSTA	TRANSISTOR
Q1551	BAAP000005	TRANSISTOR
Q1553	2SC1685QRSTA	TRANSISTOR
Q1554	2SC1685QRSTA	TRANSISTOR
Q1555	B1BAAT000001	TRANSISTOR
Q2302	2SD601ARTX	TRANSISTOR
Q2304	2SD601ARTX	TRANSISTOR
Q2305	2SD601ARTX	TRANSISTOR
Q2331	2SD601ARTX	TRANSISTOR
Q2332	2SB709ARTX	TRANSISTOR
Q2333	2SD601ARTX	TRANSISTOR
Q2334	2SD601ARTX	TRANSISTOR
Q2335	2SB709ARTX	TRANSISTOR
Q2336	2SD601ARTX	TRANSISTOR
Q2501	2SD601ARTX	TRANSISTOR
Q2502	2SD601ARTX	TRANSISTOR
Q2503	2SD601ARTX	TRANSISTOR
Q3050	2SD601ARTX	TRANSISTOR
Q3802	2SA564AQRSTA	TRANSISTOR
Q4901	2SC1685QRSTA	TRANSISTOR
	RELAYS	
RL801	**TSEH8007**	**RELAY**
RL802	**TSE10814**	**RELAY**
	RESISTORS	
R007	ERJ6GEYJ471V	RES,M 470-J-1/10W
R009	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R010	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R011	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R012	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R013	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R014	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R015	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R016	ERJ6GEYJ121V	RES,M 120-J-1/10W
R017	ERJ6GEYJ121V	RES,M 120-J-1/10W
R020	ERJ6GEYJ121V	RES,M 120-J-1/10W

REPLACEMENT PARTS LIST

Models: CT-32SX12F, CT-32SX12CF, CT-32SX12UF, CT-36SX12F, CT-36SX12CF, CT-36SX12UF.

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
R023	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R024	ERJ6GEYJ122V	RES,M 1.2K-J-1/10W
R026	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R027	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R028	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R029	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R030	ERJ6GEYJ471V	RES,M 470-J-1/10W
R031	ERJ6GEYJ471V	RES,M 470-J-1/10W
R032	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R033	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R035	ERJ6GEYJ563V	RES,M 56K-J-1/10W
R040	ERJ6GEYJ680V	RES,M 68-J-1/10W
R041	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W
R042	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R043	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R044	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R045	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R046	ERJ6GEYJ182V	RES,M 1.8K-F-1/10W
R050	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R052	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R053	ERJ6GEYJ101V	RES,M 100-J-1/10W
R054	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R055	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R056	ERJ6GEYJ471V	RES,M 470-J-1/10W
R057	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R059	ERJ6GEYJ121V	RES,M 120-J-1/10W
R060	ERJ6GEYJ471V	RES,M 470-J-1/10W
R061	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R062	ERJ6GEYJ101V	RES,M 100-J-1/10W
R066	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R067	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R068	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R069	ERJ6GEYJ123V	RES,M 12K-J-1/10W
R071	ERJ6GEYJ680V	RES,M 68-J-1/10W
R072	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W
R073	ERJ6GEYJ471V	RES,M 470-J-1/10W
R074	ERJ6GEYJ471V	RES,M 470-J-1/10W
R075	ERJ6ENF3902V	RES,M 39K-F-1/10W
R076	ERJ6ENF6201V	RES,M 6.2K-F-1/10W
R080	ERJ6GEYJ101V	RES,M 100-J-1/10W
R084	ERJ6GEYJ182V	RES,M 1.8K-J-1/10W
R086	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R087	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R088	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R089	ERJ6GEYJ101V	RES,M 100-J-1/10W
R090	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R091	ERJ6GEYJ221V	RES,M 220-J-1/10W
R092	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R095	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R401	ERJ6GEYJ123V	RES,M 12K-J-1/10W

REF NO.	PART NO.	DESCRIPTION
R403	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R404	ERJ6GEYJ471V	RES,M 470-J-1/10W
R405	ERJ6GEYJ122V	RES,M 1.2K-J-1/10W
R406	ERJ6GEYJ821V	RES,M 820-F-1/10W
R450	ERJ6GEYJ821V	RES,M 820-J-1/10W
R451	ERG2FJ221H	RES,M 220-J-2W
R452	ERDS1FJ6R8T	RES,C 6.8-J-1/2W
R453	ER0S2THF1202	RES,M 1.2K-F-1/4W
R454	ERDS2TJ182T	RES,C 1.8K-J-1/4W
R455	ERDS2TJ512T	RES,C 5.1K-J-1/4W
R456	ERDS2TJ182T	RES,C 1.8K-J-1/4W
R457	ERDS2TJ112T	RES,C 1.1K-J-1/4W
R458	ERDS2TJ562T	RES,C 5.6K-J-1/4W
R459	ERX1SJ1R2P	RES,M 1.2-J-1W
R460	ER0S2THF8871	RES,M 8.87K-F-1/4W
R461	ER0S2THF1541	RES,M 1.54K-F-1/4W
R462	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R468	ERJ6GEYJ104V	RES,M 100K-J-1/10W
R469	ERJ6GEYJ101V	RES,M 100-J-1/10W
R470	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R471	ERJ6GEYJ224V	RES,M 220K-J-1/10W
R472	ERJ6GEYJ123V	RES,M 12K-J-1/10W
R480	ERDS2TJ392T	RES,C 3.9K-J-1/4W
R481	ERDS1FJ1R0T	RES,C 1.0-J-1/2W
R482	ERDS1FJ1R0T	RES,C 1.0-J-1/2W
R485	ERJ6GEYJ152V	RES,M 1.5K-J-1/10W
R486	ERJ6GEYJ473V	RES,M 47K-J-1/10W
R487	ERJ6GEYJ822V	RES,M 8.2K-J-1/10W
R489	ER0S2THF1202	RES,M 12K-F-1/4W
R490	ER0S2THF5101	RES,M 5.1K-F-1/4W
R491	ER0S2THF1052	RES,M 10.5K-F-1/4W
R500	ERJ6GEYJ471V	RES,M 470-J-1/10W
R501	ERDS2TJ561T	RES,C 560-J-1/4W
R502	ERDS2TJ561T	RES,C 560-J-1/4W
R503	ERG3FJ332H	RES,M 2.3K-J-3W
R504	ERJ6GEYJ561V	RES,M 560-J-1/10W
R505	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R506	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R507	ERDS2TJ301T	RES,C 300-J-1/4W
R508	ERDS2TJ562T	RES,C 5.6K-J-1/4W
R509	ERDS2TJ332T	RES,C 3.3K-J-1/4W
R510	ERG2FJ122H	RES,M 12K-J-2W
R512	ERG3FJ222H	RES,M 2200-J-3W
R513	ERG3FJ222H	RES,M 2200-J-3W
R514	ER0S2THF3482	RES,M 34.8K-F-1/4W
R515	ER0S2THF3742	RES,M 37.4K-F-1/4W
R516	ERDS2TJ101T	RES,C 100-J-1/4W
R517	ERG1SJ103P	RES,M 10K-J-1W
R518	**ERDS1FJ1R5T**	**RES,C 1.5-J-1/2W**
R519	**ERQ1CJ1R5**	**RES,F 1.5-J-1W** ***CT-32SX12F/CF/UF***

REPLACEMENT PARTS LIST

Models: CT-32SX12F, CT-32SX12CF, CT-32SX12UF, CT-36SX12F, CT-36SX12CF, CT-36SX12UF.

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
R519	**ERQ1CZKR22**	**RES,F .22-K-1W** ***CT-36SX12F/CF/UF***
R520	**ERQ14AJ2R2E**	**RES,F 2.2-J-1/4W**
R521	**ER0S2THF8201**	**RES,M 8.2-K-1/4W**
R522	**ER0S2THF1001**	**RES,M 1K-F-1/4W**
R523	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R524	EVMEASA00B34	RESISTOR, VARIABLE
R525	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W
R527	ERJ6GEYJ391V	RES,M 390-J-1/10W
R540	ERJ6GEYJ105V	RES,M 1M-J-1/10W
R541	ERJ6GEYJ274V	RES,M 270K-J-1/10W
R542	ERJ6GEYJ124V	RES,M 120K-J-1/10W
R560	ERJ6GEYJ332V	RES,M 3.3K-J-1/10W
R561	ERJ6ENF2401V	RES,M 2.4K-F-1/10W
R562	ERDS2TJ103T	RES,C 10K-J-1/4W
R563	ERDS2TJ103T	RES,C 10K-J-1/4W
R564	ERDS2TJ472T	RES,C 4.7K-J-1/4
R565	ERDS2TJ472T	RES,C 4.7K-J-1/4
R566	ERDS2TJ332T	RES,C 3.3K-J-1/4W
R567	ERDS2TJ122T	RES,C 1.2K-J-1/4W
R568	ERJ6GEYJ122V	RES,M 1.2K-J-1/10W
R576	ERQ12AJ101P	RES,F 100-J-1/2W
R590	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W *CT-36SX12F/CF/UF*
R591	ERJ6GEYJ332V	RES,M 3.3K-J-1/10W *CT-36SX12F/CF/UF*
R592	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R593	ERJ6ENF3900V	RES,M 390-F-1/10W
R594	ERJ6ENF4700V	RES,M 470-F-1/10W
R596	ERDS2TJ102T	RES,C 1K-J-1/4W *CT-36SX12F/CF/UF*
R597	ERJ6GEYJ103V	RES,M 10K-J-1/10W *CT-36SX12F/CF/UF*
R713	ERDS2TJ822T	RES,C 8.2K-J-1/4W
R716	ERDS2TJ101T	RES,C 100-J-1/4W
R720	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R756	ERG2FJ820H	RES,M 82-J-2W
R759	ERDS2TJ472T	RES,C 4.7K-J-1/4
R760	ERDS2TJ472T	RES,C 4.7K-J-1/4
R761	ERDS2TJ472T	RES,C 4.7K-J-1/4
R762	ERDS2TJ101T	RES,C 100-J-1/4W
R801	**ERF7ZK1R0**	**RES,W 1.0-K-7W**
R802	ERC14GK824D	RES,C 820K-K-1/4W
R807	ERDS2TJ820T	RES,C 82-J-1/4W
R808	ERDS2TJ680T	RES,C 68-J-1/4W
R809	ERDS2TJ472T	RES,C 4.7K-J-1/4
R810	ERDS2TJ473T	RES,C 47K-J-1/4W
R811	ERDS2TJ472T	RES,C 4.7K-J-1/4
R812	ERDS2TJ473T	RES,C 47K-J-1/4W
R813	ERDS1FJ122T	RES,C 1.2K-J-1/2
R814	ERG3FJ103H	RES,M 10K-J-3W
R815	ERDS2TJ331T	RES,C 330-J-1/4W
R816	ERDS2TJ471T	RES,C 470-J-1/4W

REF NO.	PART NO.	DESCRIPTION
R817	ER0S2THF1371	RES,M 1.37K-F-1/4W
R818	ERDS2TJ220T	RES,C 22-J-1/4W
R819	ERDS1FJ390T	RES,C 39-J-1/2W
R820	ERDS1FJ120T	RES, C 12-J-1/2W
R821	ERX12SJ1R0P	RES,M 1.0-J-1/2W
R822	ERX12SJ1R0P	RES,M 1.0-J-1/2W
R823	ERDS2TJ102T	RES,C 1K-J-1/4W
R824	ERDS2TJ153T	RES,C 15K-J-1/4W
R825	ERDS2TJ104T	RES,C 100K-J-1/4W
R826	ERDS2TJ103T	RES,C 10K-J-1/4W
R828	ERDS2TJ103T	RES,C 10K-J-1/4W
R829	ERDS2TJ103T	RES,C 10K-J-1/4W
R830	ERDS2TJ103T	RES,C 10K-J-1/4W
R832	**ERD75TAJ825**	**RES,C 8.2MEG-J-3/4W**
R835	ERDS2TJ101T	RES,C 100-J-1/4W
R836	ERG2SJ273P	RES,M 27K-J-2W
R837	ERDS2TJ222T	RES,C 2.2K-J-1/4W
R839	ERDS2TJ222T	RES,C 2.2K-J-1/4W
R840	ERDS2TJ470T	RES,C 47-J-1/4W
R846	ERDS2TJ473T	RES,C 47K-J-1/4W
R847	ERDS2TJ182T	RES,C 1.8K-J-1/4W
R850	ERX3FJ2R7	RES,M 2.7-J-3W
R852	ERDS1FJ391T	RES,C 390-J-1/2W
R855	ERDS2TJ913T	RES,C 91K-J-1/4W
R856	ERDS2TJ123T	RES,C 12K-J-1/4W
R857	ERDS1FJ1R0T	RES,C 1.0-J-1/2W
R858	ERDS1FJ1R0T	RES,C 1.0-J-1/2W
R859	ERDS2TJ103T	RES,C 10K-J-1/4W
R860	ERDS1FJ102T	RES,C 1K-J-1/2W
R861	**ERX12SJR22P**	**RES,M .22-J-1/2W**
R862	**ERX12SJR22P**	**RES,M .22-J-1/2W**
R863	**ERX12SJR22P**	**RES,M .22-J-1/2W**
R864	ERG3FJ220H	RES,M 22-J-3W
R881	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R882	ERJ6GEYJ271V	RES,M 270-J-1/10W
R883	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R884	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R885	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R886	ERDS2TJ181T	RES,C 180-J-1/4W
R902	ERJ6GEYJ122V	RES,M 1.2K-J-1/10W
R903	ERJ6GEYJ561V	RES,M 560-J-1/10W
R905	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R906	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R908	ERJ6GEYJ683V	RES,M 68K-J-1/10W
R909	ERJ6GEYJ333V	RES,M 33K-J-1/10W
R951	ERDS2TJ821T	RES,C 820-J-1/4W
R952	ERDS2TJ223T	RES,C 22K-J-1/4W
R953	ERDS2TJ332T	RES,C 3.3K-J-1/4W
R954	ERDS2TJ431T	RES,C 430-J-1/4W
R956	ERDS2TJ510T	RES,C 51-J-1/4W

REPLACEMENT PARTS LIST

Models: CT-32SX12F, CT-32SX12CF, CT-32SX12UF, CT-36SX12F, CT-36SX12CF, CT-36SX12UF.

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
R958	ERDS2TJ391T	RES,C 390-J-1/4W
R959	ERDS2TJ101T	RES,C 100-J-1/4W
R960	ERQ14AJ100P	RES,F 10-J-1/4W
R961	ERQ1CJP331S	RES,F 330-J-1W
R962	ERDS2TJ330T	RES,C 33-J-1/4W
R963	ERDS2TJ330T	RES,C 33-J-1/4W
R964	ERDS2TJ471T	RES,C 470-J-1/4W
R965	ERDS2TJ563T	RES,C 56K-J-1/4W
R966	ERDS1FJ471P	RES,C 470-J-1/2W
R967	ERDS2TJ563T	RES,C 56K-J-1/4W
R968	ERDS2TJ471T	RES,C 470-J-1/4W
R969	ERDS2TJ390T	RES,C 39-J-1/2W
R970	ERDS2TJ2R7T	RES,C 2.7-J-1/4W
R971	ERDS2TJ2R7T	RES,C 2.7-J-1/4W
R972	ERDS2TJ390T	RES,C 39-J-1/2W
R973	ERDS2TJ101T	RES,C 100-J-1/4W
R974	ERDS2TJ333T	RES,C 33K-J-1/4W
R975	ERDS2TJ101T	RES,C 100-J-1/4W
R976	ERDS2TJ101T	RES,C 100-J-1/4W
R977	ERDS2TJ561T	RES,C 560-J-1/4W
R978	ERDS2TJ101T	RES,C 100-J-1/4W
R987	ERDS2TJ821T	RES,C 820-J-1/4W
R988	ERDS2TJ331T	RES,C 330-J-1/4W
R989	ERDS2TJ682T	RES,C 6.8K-J-1/4W
R990	ERDS2TJ471T	RES,C 470-J-1/4W
R993	ERDS2TJ471T	RES,C 470-J-1/4W
R1051	ER0S2THF1002	RES,M 10K-F-1/4W
R1052	ERDS2TJ222T	RES,C 2.2K-J-1/4W
R1053	ERDS2TJ222T	RES,C 2.2K-J-1/4W
R1054	ERDS2TJ332T	RES,C 3.3K-J-1/4W
R1055	ERDS2TJ512T	RES,C 5.1K-J-1/4W
R1056	ERDS2TJ912T	RES,C 9.1K-J-1/4W
R1057	ERDS2TJ223T	RES,C 22K-J-1/4W
R1058	ERDS2TJ103T	RES,C 10K-J-1/4W
R1059	ERDS2TJ102T	RES,C 1K-J-1/4W
R1060	ERDS2TJ470T	RES,C 47-J-1/4W
R1061	ERDS2TJ101T	RES,C 100-J-1/4W
R1062	ERDS2TJ182T	RES,C 1.8K-J-1/4W
R1510	ERC12GK101D	RES,C 100-K-1/2W
R1511	ERDS2TJ913T	RES,C 91K-J-1/4W *CT-32SX12F/CF/UF*
R1512	ERDS2TJ913T	RES,C 91K-J-1/4W *CT-32SX12F/CF/UF*
R1513	ERDS2TJ753T	RES,C 75K-J-1/4W *CT-32SX12F/CF/UF*
R1550	ERDS2TJ273T	RES,C 27K-J-1/4W
R1555	ERDS2TJ272T	RES,C 2.7K-J-1/4W
R1563	ER0S2THF5602	RES,M 56K-F-1/4W
R1564	ER0S2THF3001	RES,M 3K-F-1/4W
R1566	ERDS2TJ104T	RES,C 100K-J-1/4W
R1567	ERDS2TJ104T	RES,C 100K-J-1/4W
R1568	ERDS2TJ104T	RES,C 100K-J-1/4W
R1570	ERC12GK104D	RES,C 100K-K-1/2W

REF NO.	PART NO.	DESCRIPTION
R1571	ERG3FJ821H	RES,M 820-J-3W
R1572	ERDS2TJ334T	RES,C 330K-J-1/4W
R1573	ERDS2TJ473T	RES,C 47K-J-1/4W
R1576	ERDS2TJ101T	RES,C 100-J-1/4W
R1579	ERDS2TJ224T	RES,C 220K-J-1/4W
R1580	ERDS2TJ153T	RES,C 15K-J-1/4W
R1583	ERDS2TJ102T	RES,C 1K-J-1/4W
R1584	ERDS2TJ103T	RES,C 10K-J-1/4W
R1585	ERDS2TJ563T	RES,C 56K-J-1/4W
R1586	ERDS2TJ333T	RES,C 33K-J-1/4W
R1588	ERG2FJ472H	RES,M 4.7K-J-2W
R1589	ERG3FJ821H	RES,M 820-J-3W
R1591	ERG3FJ821H	RES,M 820-J-3W
R1593	ERDS2TJ125T	RES,C 1.2M-J-1/4W
R1594	ERDS2TJ125T	RES,C 1.2M-J-1/4W
R2203	ERJ6GEYJ751V	RES,M 750-J-1/10W
R2206	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2207	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2220	ERJ6GEYJ101V	RES,M 100-J-1/10W
R2221	ERJ6GEYJ273V	RES,M 27K-J-1/10W
R2303	ERJ6GEYJ622V	RES,M 6.2K-J-1/10W
R2304	ERJ6GEYJ622V	RES,M 6.2K-J-1/10W
R2305	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R2306	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R2307	ERJ6GEYJ822V	RES,M 8.2K-J-1/10W
R2308	ERJ6GEYJ563V	RES,M 56K-J-1/10W
R2309	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R2310	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R2311	ERJ6GEYJ271V	RES,M 270-J-1/10W
R2312	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R2316	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R2317	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R2318	ERDS1TJ332T	RES,C 3.3K-J-1/2W
R2319	ERDS1TJ332T	RES,C 3.3K-J-1/2W
R2323	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R2324	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2325	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2326	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2329	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R2331	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2332	ERJ6GEYJ105V	RES,M 1M-J-1/10W
R2333	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2334	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R2335	ERJ6GEYJ183V	RES,M 18K-J-1/10W
R2336	ERJ6GEYJ392V	RES,M 3.9K-J-1/10W
R2337	ERJ6GEYJ332V	RES,M 3.3K-J-1/10W
R2338	ERJ6GEYJ332V	RES,M 3.3K-J-1/10W
R2339	ERJ6GEYJ183V	RES,M 18K-J-1/10W
R2340	ERJ6GEYJ392V	RES,M 3.9K-J-1/10W
R2345	ERJ6GEYJ103V	RES,M 10K-J-1/10W

REPLACEMENT PARTS LIST

Models: CT-32SX12F, CT-32SX12CF, CT-32SX12UF, CT-36SX12F, CT-36SX12CF, CT-36SX12UF.

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
R2346	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2347	ERJ6GEYJ105V	RES,M 1M-J-1/10W
R2348	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2349	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R2356	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R2366	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W
R2367	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W
R2385	ERG1SJ181P	RES,M 180-J-1W
R2386	ERG1SJ181P	RES,M 180-J-1W
R2431	ERJ6GEYJ105V	RES,M 1M-J-1/10W
R2432	ERJ6GEYJ105V	RES,M 1M-J-1/10W
R2433	ERJ6ENF4701V	RES,M 4.7K-F-1/10W
R2434	ERJ6GEYJ681V	RES,M 680-J-1/10W
R2435	ERJ6ENF3902V	RES,M 39K-F-1/10W
R2436	ERJ6ENF6202V	RES,M 62K-F-1/10W
R2437	ERJ6GEYJ681V	RES,M 680-J-1/10W
R2438	ERJ6GEYJ271V	RES,M 270-J-1/10W
R2439	ERJ6GEYJ271V	RES,M 270-J-1/10W
R2501	ERJ6GEYJ331V	RES,M 330-J-1/10W
R2502	ERJ6GEYJ331V	RES,M 330-J-1/10W
R2503	ERJ6GEYJ331V	RES,M 330-J-1/10W
R2504	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2505	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2506	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2704	ERJ6GEYJ101V	RES,M 100-J-1/10W
R2705	ERJ6GEYJ101V	RES,M 100-J-1/10W
R2706	ERJ6GEYJ101V	RES,M 100-J-1/10W
R3001	ERJ6GEYJ330V	RES,M 33-J-1/10W
R3002	ERJ6GEYJ330V	RES,M 33-J-1/10W
R3003	ERJ6GEYJ330V	RES,M 33-J-1/10W
R3004	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R3005	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R3006	ERJ6GEYJ330V	RES,M 33-J-1/10W
R3007	ERJ6GEYJ104V	RES,M 100K-J-1/10W
R3008	ERJ6GEYJ104V	RES,M 100K-J-1/10W
R3009	ERJ6GEYJ330V	RES,M 33-J-1/10W
R3010	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R3011	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R3012	ERJ6GEYJ104V	RES,M 100K-J-1/10W
R3013	ERJ6GEYJ104V	RES,M 100K-J-1/10W
R3014	ERJ6GEYJ330V	RES,M 33-J-1/10W
R3015	ERJ6GEYJ330V	RES,M 33-J-1/10W
R3017	ERJ6GEYJ750V	RES,M 75-F-1/10W
R3020	ERJ6GEYJ330V	RES,M 33-J-1/10W
R3021	ERJ6GEYJ750V	RES,M 75-J-1/10W
R3022	ERJ6GEYJ750V	RES,M 75-J-1/10W
R3023	ERJ6GEYJ750V	RES,M 75-J-1/10W
R3029	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R3030	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R3060	ERJ6GEYJ471V	RES,M 470-J-1/10W
R3061	ERJ6GEYJ471V	RES,M 470-J-1/10W
R3065	ERJ6GEYJ100V	RES,M 10-J-1/10W
R3069	ERJ6GEYJ471V	RES,M 470-J-1/10W
R3152	ERDS2TJ224T	RES,C 220K-J-1/4W
R3154	ERDS2TJ224T	RES,C 220K-J-1/4W
R3801	ERDS2TJ102T	RES,C 1K-J-1/4W
R3802	ERDS2TJ102T	RES,C 1K-J-1/4W
R3803	ERDS2TJ102T	RES,C 1K-J-1/4W
R3804	ER0S2THF1201	RES,M 1.2K-F-1/4W
R3805	ER0S2THF1201	RES,M 1.2K-F-1/4W
R3806	ER0S2THF1201	RES,M 1.2K-F-1/4W
R3808	ER0S2THF1101	RES,M 1.1K-F-1/4W
R3810	ER0S2THF1101	RES,M 1.1K-F-1/4W
R3811	ER0S2THF1101	RES,M 1.1K-F-1/4W
R3814	ER0S2THF8451	RES,M 8.45K-F-1/4W
R3815	ERG1SJ104P	RES,M 100K-J-1W
R3816	ERDS2TJ103T	RES,C 10K-J-1/4W
R3817	ERG1SJ104P	RES,M 100K-J-1W
R3818	ERG1SJ104P	RES,M 100K-J-1W
R3819	ER0S2THF1601	RES,M 1.6K-F-1/4W
R3823	ERQ12AJ121P	RES,F 120-J-1/2W
R3824	ERC12GK222V	RES,C 2200-K-1/2W
R3825	ERC12GK222V	RES,C 2200-K-1/2W
R3826	ERC12GK222V	RES,C 2200-K-1/2W
R4838	ERDS2TJ101T	RES,C 100-J-1/4W
R4929	ERDS2TJ562T	RES,C 5.6K-J-1/4W
R4930	ERDS2TJ103T	RES,C 10K-J-1/4W
R4931	ERDS2TJ103T	RES,C 10K-J-1/4W
R4932	ERDS2TJ472T	RES,C 4.7K-J-1/4
R4933	ERDS2TJ472T	RES,C 4.7K-J-1/4
R4934	ERDS2TJ153T	RES,C 15K-J-1/4W
R4935	ERDS2TJ153T	RES,C 15K-J-1/4W
R4936	ERDS2TJ103T	RES,C 10K-J-1/4W
R4939	ERDS2TJ101T	RES,C 100-J-1/4W
R4942	ERDS2TJ101T	RES,C 100-J-1/4W
R4943	ERDS2TJ101T	RES,C 100-J-1/4W
R4944	ERDS2TJ105T	RES,C 1M-J-1/4W
R4945	ERDS2TJ105T	RES,C 1M-J-1/4W
R4946	ER0S2THF5602	RES,M 56K-F-1/4W
R4947	ER0S2THF2001	RES,M 2K-F-1/4W
R4948	ERDS2TJ822T	RES,C 8.2K-J-1/4W
R4949	ERDS2TJ102T	RES,C 1K-J-1/4W
R4950	ERDS1FJ391T	RES,C 390-J-1/2W
R4951	ERX12SJR68P	RES,M .68-J-2W
R4952	ERX12SJR68P	RES,M .68-J-2W
R4953	ERDS1FJ391T	RES,C 390-J-1/2W
R4965	ER0S2THF1502	RES,M 15.0K-F-1/4W
R4966	ER0S2THF6801	RES,M 6.8K-F-1/4W
R4968	ERDS2TJ473T	RES,C 47K-J-1/4W
R4969	ERDS2TJ333T	RES,C 33K-J-1/4W

REPLACEMENT PARTS LIST

Models: CT-32SX12F, CT-32SX12CF, CT-32SX12UF, CT-36SX12F, CT-36SX12CF, CT-36SX12UF.

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
R4970	ERDS2TJ683T	RES,C 68K-J-1/4W
R4971	ERDS2TJ100T	RES,C 10-J-1/4W
R4974	ERDS2TJ102T	RES,C 1K-J-1/4W
R4975	ERDS2TJ473T	RES,C 47K-J-1/4W
R4976	ERDS1FJ470T	RES,C 47-J-1/2W
R5013	ERDS1FJ1R0T	RES,C 1.0-J-1/2W
	SWITCHES	
S001	EVQPF106K	SWITCH
S002	EVQPBD05R	SWITCH
S003	EVQPBD05R	SWITCH
S004	EVQPBD05R	SWITCH
S005	EVQPBD05R	SWITCH
S006	EVQPBD05R	SWITCH
S007	EVQPBD05R	SWITCH
	TRANSFORMERS	
T501	ETH19Y70AY	HORIZONTAL DRIVER TRANSFORMER
T551	**KFT5AA369F**	**FLYBACK TRANSFORMER** ***CT-36SX12F/CF/UF***
T551	**KFT6AA424F**	**FLYBACK TRANSFORMER** ***CT-32SX12F/CF/UF***
T801	**ETS44KA165AG**	**TRANSFORMER**
T802	**TLP16297**	**POWER SUPPLY TRANSFORMER**
T1551	**ETF18L108A**	**TRANSFORMER**
	CRYSTRALS/FILTERS	
X001	AF080005BE	CRYSTAL
	OTHERS	
TNR001	**ENG36613GR**	**TUNER (main)**
TNR002	**ENG36604GR**	**TUNER (sub)**
M001	**TSX2AA0111-1**	**A/C LINE CORD (SPT2)**
M002	TMW2A97121	STRAIN RELIEF: AC LINE CORD
M003	**A90LSW295X**	**CRT 36"** ***CT-36SX12F/CF/UF***
M004	**M80LSW295X**	**CRT 32"** ***CT-32SX12F/CF/UF***
M005	**TJSC01100**	**CRT SOCKET** ***CT-32SX12F/CF/UF***
DY	**TLY2AA023**	**DEFLECTION YOKE** ***CT-32SX12F/CF/UF***
DY	**TLY2AA025**	**DEFLECTION YOKE** **CT-36SX12F/CF/UF**
M006	0FMK014ZZ	CONVERGENCE CORRECTOR STRIP
M007	TSN63115-4	PURITY MAGNET
DEG	**TSP2AA015**	**COIL, DEGAUSSING 36"** ***CT-36SX12F/CF/UF***
DEG	**TSP2AA016-1**	**COIL, DEGAUSSING 32"** ***CT-32SX12F/CF/UF***

REF NO.	PART NO.	DESCRIPTION
M008	TSP2AF007	COIL, ROTATION
M009	TSP2AF009	COIL, GEOMAGNETIC *CT-32SX12F/CF/UF*
M010	TSP2AF008	COIL, GEOMAGNETIC *CT-36SX12F/CF/UF*
M011	TXFKU03FSER	ASSY, CABINET BACK (Cabinet back, rubber sheet, felt, label BBE patent, label x-ray warning) *CT-36SX12F/CF/UF*
M012	TXFKU05FSER	ASSY, CABINET BACK (Back cover, rubber sheet, nameplate model, felt, label x-ray warning) *CT-32SX12F/CF/UF*
M013	TXFKY12FSER	ASSY, CABINET FRONT (cabinet front , badge Panasonic, overlay, IR panel, felt, felt roll, label service info ref) CT-36SX12F/CF/UF
M014	TXFKY13FSER	ASSY, CABINET FRONT (Cabinet front, 3 rubber sheet, badge Panasonic, overlay, felt, felt roll, label sevice info ref) *CT-32SX12F/CF/UF*
M015	TAS2AA0024	SPEAKER 8-OHM
M016	TXFSPB01BSER	ASSY, SPEAKER BRACKETS
M017	TEK6940	DOOR CATCH
M018	TKP2AA0391	IR GUIDE
M019	TBM2AA0024	BADGE, PANASONIC
M020	TXFBX01ESER	ASSY, POWER BUTTON
M021	TXFKP03FSER	ASSY, FRONT PANELS *CT-32SX12F/CF/UF*
M022	TXFKP01FSER	ASSY, FRONT PANELS *CT-36SX12F/CF/UF*
M023	TKP2AA0403S	FRONT DOOR
JK3001	TJB2AA0401	TERMINAL, REAR A/V
JK3151	TJBA187	JACK, A/V OUTPUT
	ACCESORIES	
M021	EUR7613Z10	REMOTE CONTROL
M022	UR76EC0303A	REMOTE BATTERY COVER
M023	TXANV08ESER	REPAIR KIT (FRONT PANELS) *CT-36SX12F/CF/UF*
M024	TQB2AA0383	MANUAL, OWNERS *CT-32SX12F /UF,* CT-36SX12F /12UF
M025	TQB2AA0390	MANUAL, OWNERS *CT-32SX12CF,* CT-36SX12CF

Description of abbreviations guide

RESISTOR			
TYPE		TOLERANCE	
C	Carbon	F	± 1%
F	Fuse	J	± 5%
M	Metal Oxide	K	± 10%
S	Solid	M	± 20%
W	Wire Wound	G	± 2%

RES, C 270-J-1/4

CAPACITOR			
TYPE		TOLERANCE	
C	Ceramic	C	± 0.25pF
E	Electrolytic	D	± 0.5pF
P	Polyester	F	± 1pF
S	Styrol	J	± 5%
T	Tantalum	K	± 10%
		L	± 15%
		M	± 20%
		P	+10% -0%
		Z	+80% -20%

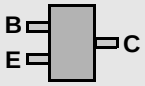
CAP, P .068UF-K-50V

Notes:

IMPORTANT SAFETY NOTICE

THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES THAT ARE IMPORTANT FOR PROTECTION FROM X-RADIATION, FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURERS SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS DESIGNATED WITH A ⚠ IN THE SCHEMATIC.

CHIP TRANSISTOR LEAD DESIGNATION



SCHEMATIC NOTES

1. Resistors are carbon 1/4W unless noted otherwise.
2. Capacitors are ceramic 50V unless noted otherwise.
3. Coil value notes is inductance in μH.
4. Test point indicated by ; Test point but no pin .
5. Components indicated with ⚠ are critical parts and replacement should be made with manufacture specified replacement parts only.
6. (**BOLD LINE**) indicates the route of B+ supply.
7. The schematic diagrams are current at the time of printing and are subject to change without notice.
8. Ground symbol indicates **HOT GROUND CONNECTION**; indicates COLD GROUND.

NOTE: All other component symbols are used for engineering design purposes.

VOLTAGE MEASUREMENTS

1. Voltage measurement:
   - AC input to the Receiver is 120V. NTSC (HD, 1125i & 525P when applicable) signal generator is connected to the antenna of the Receiver. (Color bar pattern of 100 IRE white and 7.5 IRE black.)
   - All Picture and Audio adjustments are set to Normalize.
     TV ANT/CABLE - (Set-Up Menu) in TV/ANT Mode
     Volume - Min.
     TV/Video SW - TV position
     Audio Mode - Stereo
   - Voltage readings are nominal and may vary ±10% on active devices. Some voltage reading will vary with signal strength and picture content.
   - Supply voltages are nominal.
2. Ground symbol indicates ground lead connection of meter.
   Incorrect ground connection will result in erroneous readings.

CAUTION: ***Incorrect ground connection of the test equipment will result in erroneous readings.***

WAVEFORM MEASUREMENTS

1. ③ indicates waveform measurement. (Measurement can be taken at the best accessible location in common to the indicated point.)
2. Taken with an NTSC signal generator connected to the antenna terminal. (NTSC color bar pattern of 8 bars of EIA colors, 100 IRE white and 7.5 IRE black.)
3. Customer Controls (Picture/Audio Menu) are set to Normalize. Volume is set to “MIN”.
4. All video and color waveforms are taken with a wideband scope and a probe with low capacitance (10 to 1). Shape and peak altitudes may vary depending on the type of Oscilloscope used and its settings.
5. Ground symbol shown on waveform number indicates (Hot) ground lead connection of the Oscilloscope.

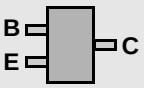
CAUTION: Incorrect ground connection of the test equipment will result in erroneous readings.

Notas

NOTA DE SEGURIDAD

LOS DIAGRAMAS ELÉCTRICOS INCLUYEN CARACTERÍSTICAS ESPECIALES MUY IMPORTANTES PARA LA PROTECCIÓN CONTRA RAYOS-X, QUEMADURAS Y DESCARGAS ELÉCTRICAS. CUANDO SE DE SERVICIO ES IMPORTANTE USAR PARA REEMPLAZO DE COMPONENTES CRITICOS, SOLO PARTES ESPECIFICADAS POR EL FABRICANTES. LOS COMPONENTES CRITICOS ESTAN SEÑALADOS EN LOS DIAGRAMAS POR EL SIMBOLO ⚠.

IDENTIFICACIÓN DE TERMINALES PARA TRANSISTORES EN *CHIP*



NOTAS DE LOS DIAGRAMAS

1. Las Resistencias son de Carbón de 1/4W, a menos que se indique otra característica.
2. Los Capacitores son de Cerámica para 50V, a menos que se indique otra característica.
3. El valor indicado de las Bobinas es la inductancia expresada en μH.
4. Los puntos de prueba en la terminal de algún componente son indicados por ⏽ Los puntos de prueba fuera de los componentes se indican con ⏽.
5. Los componentes señalados con el símbolo ⚠ son considerados componentes críticos y deben ser reemplazados sólo con las partes especificadas por el fabricante.
6. ▬ (**LINEA GRUESA**) indica las líneas de alimentación de los Voltajes B+.
7. Los diagramas eléctricos están sujetos a cambio sin previo aviso.
8. El símbolo ⏚ indica que es una conexión a **Tierra Caliente** y el símbolo ⏚ indica conexión a **Tierra Fría**.

NOTA: Los demas símbolos de componentes incluidos son usados con fines de diseño.

MEDICIÓN DE VOLTAJES

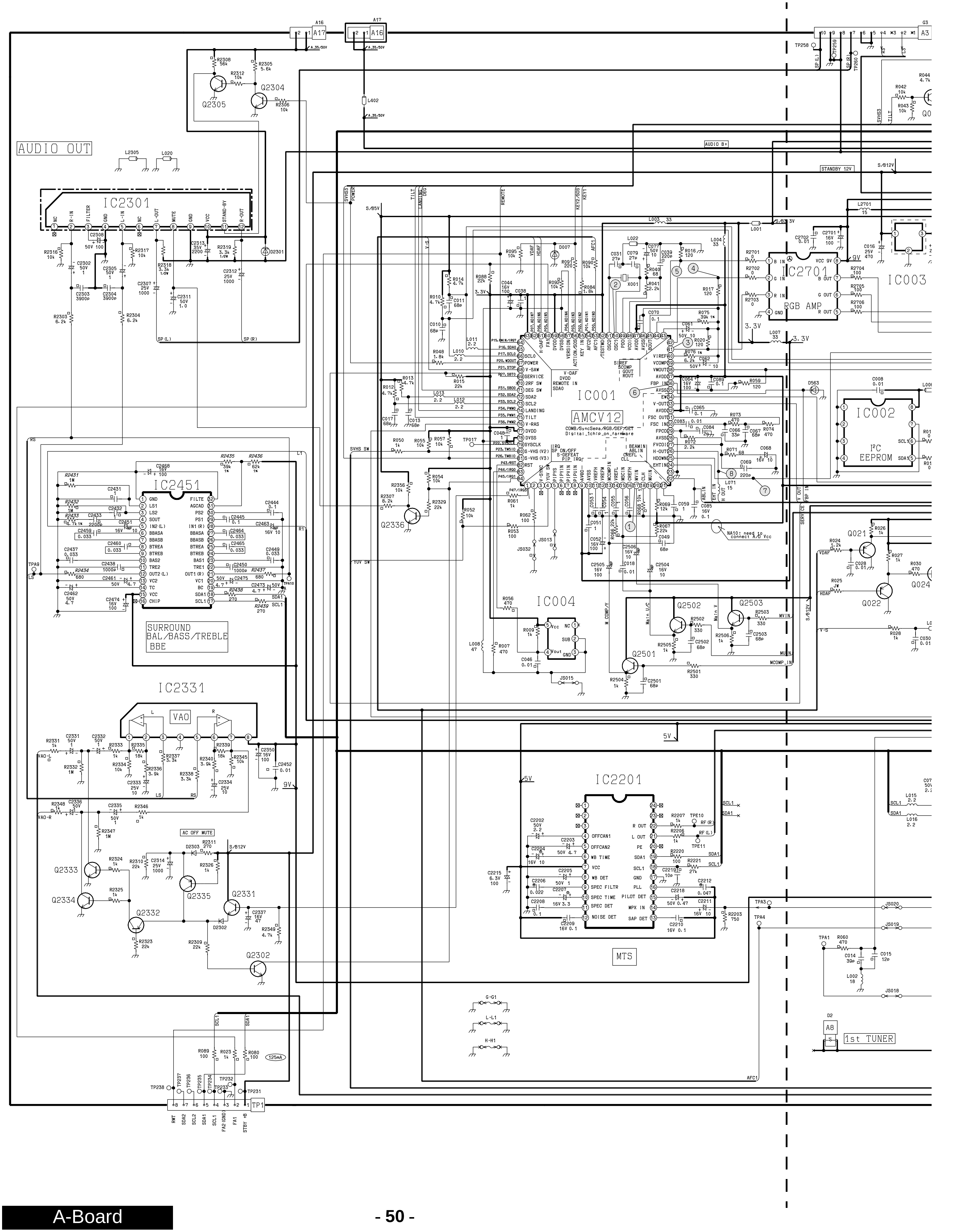
1. Medición de voltaje:
   - El voltaje de entrada al Receptor es de 120V de Corriente Alterna. Un generador de patrones con formato NTSC se conecta a la entrada de la antena. (Patrón de Barras de Colores con 100 IREs para el Blanco y 7.5 IREs para el Negro.)
   - Los ajustes de los Menus Picture y Audio se normalizan.
     En el Menú Set-Up, en la opción ANTENA, se selecciona el modo de CABLE.
     El nivel de Volumen se minimiza.
     De los modos TV y Video, seleccionar el modo TV.
     Seleccionar modo Estereo del Audio.
   - Las mediciones de los voltajes son nominales y pueden variar hasta 10% en componentes en funcionamiento. Las lecturas de los voltajes pueden variar por la potencia de la señal y el contenido de la imagen.
   - Las fuentes de voltajes son nominales.
2. El símbolo ⏚ indica el tipo de tierra que se utiliza en la conexión del medidor.

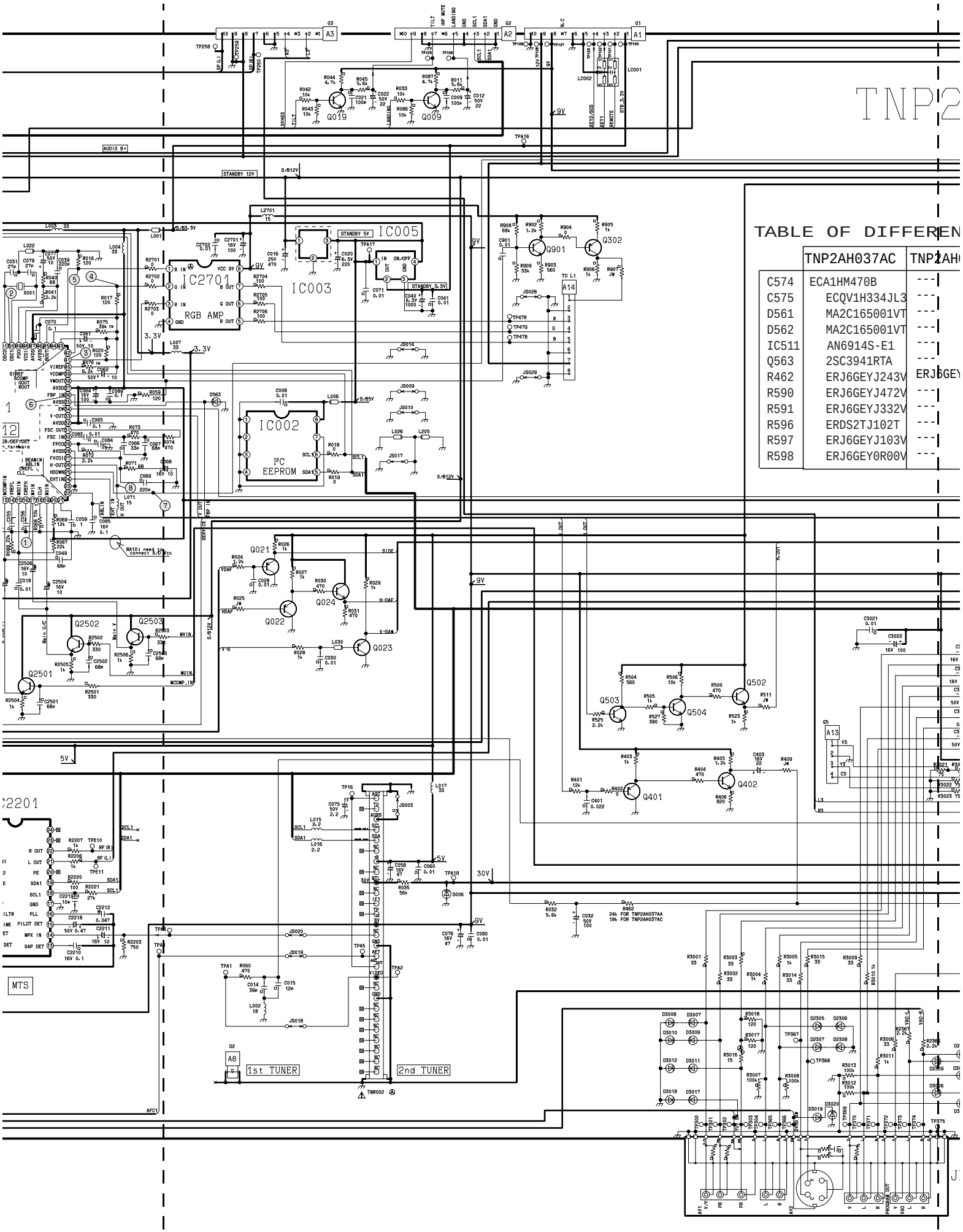
PRECAUCION: SI no se utiliza la conexión a la tierra adecuada, se obtendrán mediciones equivocadas y podría dañar el equipo de medición.

MEDICIÓN DE FORMAS DE ONDA

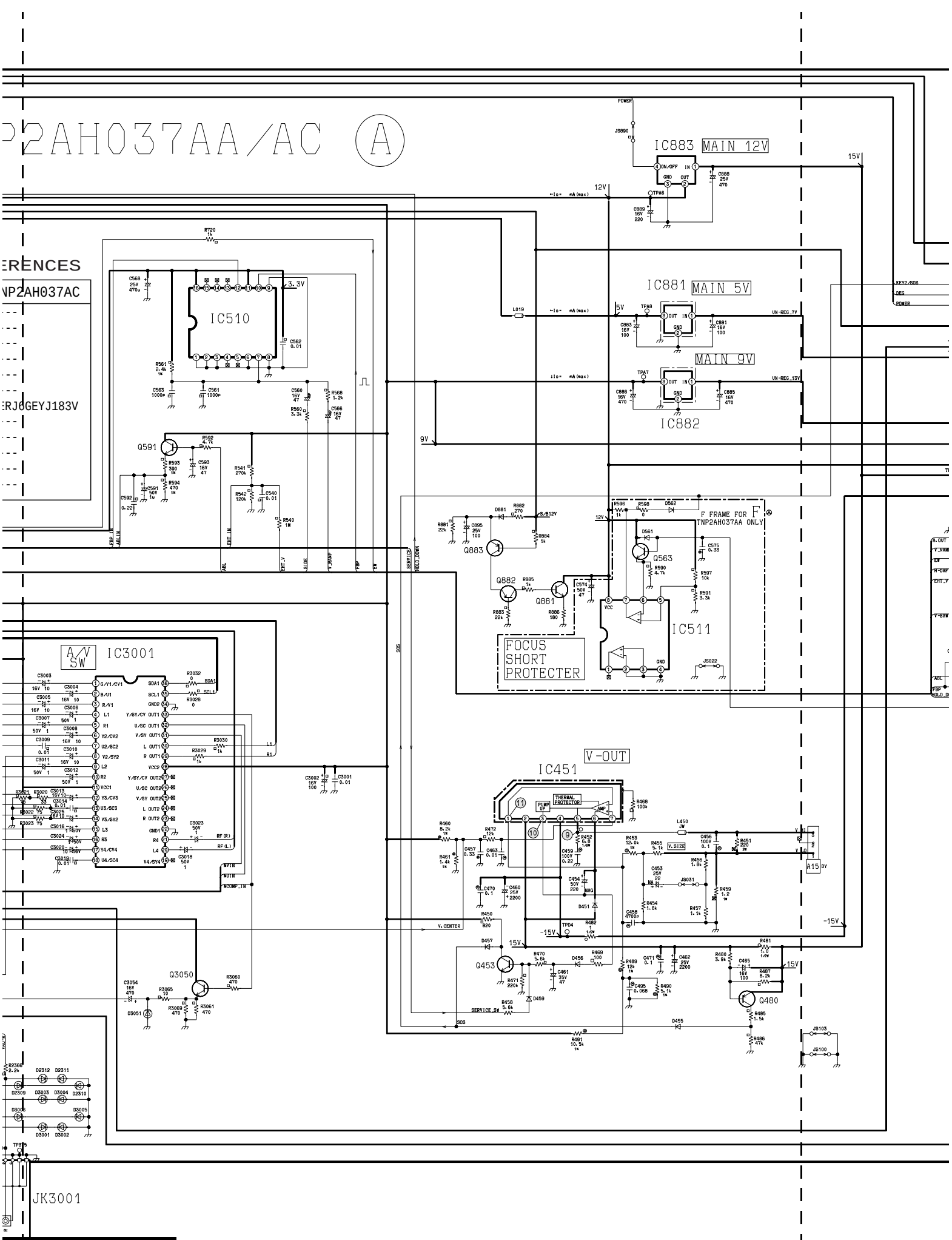
1. Un símbolo como ③ indica el punto para medir una señal. (La medición puede hacerse en el punto con mayor accesibilidad, siempre que sea común al indicado.)
2. Se midieron utilizando un generador con formato NTSC conectado a la terminal de la antena. (Patrón de 8 Barras de Colores EAI, formato NTSC de 100 IREs para el Blanco y 7.5 IREs para el Negro.)
3. Los ajustes de usuario de los Menus PICTURE y AUDIO se normalizaron. Posteriormente el nivel de volumen se ajusta al mínimo.
4. Las formas de onda de Video y Color fueron tomadas con un osciloscopio de banda alta y con un punta de prueba de baja capacitancia (10 a 1). La forma y amplitud de las ondas puede variar según el tipo de osciloscopio que se utilice y sus características.
5. El símbolo de tierra ⏚ que aparece junto al número de la forma de onda, indica que se utiliza conexión a **Tierra Caliente** en el extremo negativo de la punta de prueba.

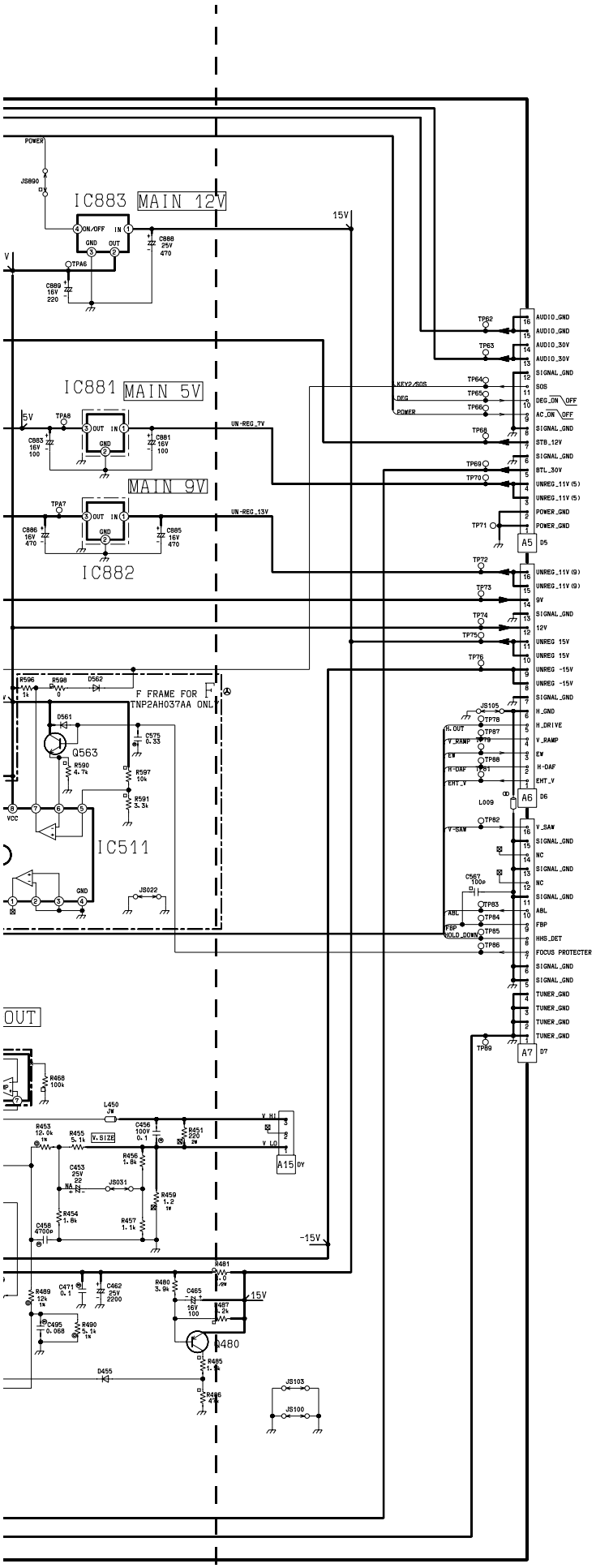
PRECAUCION: Si no se utiliza la conexión a la tierra adecuada, se obtendrán mediciones equivocadas y podría dañar el equipo de medición.


AUDIO OUT
IC2301
NC R-IN FILTER GND L-IN NC L-OUT MUTE GND VCC STAND-BY R-OUT
Q2304
Q2305
A16 A17
A17 A16
G3 A3
AUDIO B+
STANDBY 12V
S/B12V
S/B5V
S/B3.3V
IC001
AMCV12
COMB/SyncSepa/RGB/DEF/DET
Digital_1chip_on_farmware
IC2701
RGB AMP
B IN G IN R IN GND VCC 9V B OUT G OUT R OUT
IC003
IC002
I²C EEPROM
NA10: need to connect A/D Vcc
IC2451
GND LS1 LS2 SOUT IN2(L) BBASA BBASB BTREA BTREB BAS2 TRE2 OUT2(L) VC2 TC VCC CHIP
FILTE AGCAD PS2 PS1 IN1(R) BBASA BBASB BTREA BTREB BAS1 TRE1 OUT1(R) VC1 BC SDA1 SCL1
SURROUND
BAL/BASS/TREBLE
BBE
IC2331
VAO
AC OFF MUTE
Q2331 Q2332 Q2333 Q2334 Q2335 Q2302
IC004
Q2501 Q2502 Q2503
Q2336
Q021 Q022 Q024
IC2201
OFFCAN1 OFFCAN2 WB TIME VCC WB DET SPEC FILTR SPEC TIME SPEC DET NOISE DET
R OUT L OUT PE SDA1 SCL1 GND PLL PILOT DET MPX IN SAP DET
MTS
1st TUNER
TP1
RMT SDA2 SCL2 SDA1 SCL1 FA2(GND) FA1 STBY +B
125mA



	TNP2AH037AC	TNP2AH(
C574	ECA1HM470B	---
C575	ECQV1H334JL3	---
D561	MA2C165001VT	---
D562	MA2C165001VT	---
IC511	AN6914S-E1	---
Q563	2SC3941RTA	---
R462	ERJ6GEYJ243V	ERJ6GEY
R590	ERJ6GEYJ472V	---
R591	ERJ6GEYJ332V	---
R596	ERDS2TJ102T	---
R597	ERJ6GEYJ103V	---
R598	ERJ6GEY0R00V	---


P2AH037AA/AC A
ERENCES
NP2AH037AC
ERJ6GEYJ183V
IC883 MAIN 12V
IC881 MAIN 5V
MAIN 9V
IC882
IC510
IC511
IC3001
A/V SW
IC451
V-OUT
Q591
Q883
Q882
Q881
Q563
Q453
Q480
Q3050
FOCUS SHORT PROTECTER
F FRAME FOR INP2AH037AA ONLY
THERMAL PROTECTOR
JK3001


IC883 MAIN 12V
IC881 MAIN 5V
MAIN 9V
IC882
IC511
F FRAME FOR F
TNP2AH037AA ONL
AUDIO_GND
AUDIO_30V
SIGNAL_GND
SOS
DEG_ON/OFF
AC_ON/OFF
STB_12V
BTL_30V
UNREG_11V (5)
POWER_GND
UNREG_11V (9)
9V
12V
UNREG 15V
UNREG -15V
H_GND
H_DRIVE
V_RAMP
EW
H-DAF
EHT_V
V_SAW
NC
ABL
FBP
HOLD_DOWN
HHS_DET
FOCUS PROTECTER
TUNER_GND
A5 D5
A6 D6
A7 D7
A15 DY
Q563
Q480
L009
L450
D455
JS103
JS100
JS022
JS031
JS105
-15V
15V

A-Board

Integrated circuits voltages A-BOARD TNP2AH037

IC001

1	0.00	43	2.45
2	0.00	44	1.63
3	0.00	45	0.19
4	0.00	46	0.00
5	0.00	47	3.26
6	0.00	48	1.73
7	0.16	49	1.73
8	0.16	50	1.55
9	3.27	51	1.59
10	0.00	52	3.16
11	2.51	53	1.78
12	1.54	54	0.00
13	1.50	55	3.34
14	0.64	56	1.51
15	1.64	57	0.00
16	2.56	58	0.00
17	1.16	59	3.15
18	1.73	60	3.15
19	1.16	61	0.68
20	1.44	62	3.06
21	0.69	63	3.15
22	1.88	64	3.28
23	0.00	65	2.80
24	1.08	66	3.00
25	2.77	67	3.00
26	0.79	68	0.81
27	1.59	69	0.00
28	0.00	70	0.00
29	1.59	71	0.00
30	1.74	72	4.98
31	0.97	73	4.98
32	3.26	74	1.82
33	2.44	75	1.70
34	2.59	76	2.57
35	0.00	77	3.15
36	2.93	78	0.00
37	3.26	79	0.00
38	0.51	80	3.15
39	2.25	81	3.15
40	1.63	82	3.15
41	0.19	83	0.00
42	0.19	84	3.12

IC002

1	0.00
2	0.00
3	0.00
4	0.00
5	2.84
6	3.00
7	0.00
8	4.98

IC003

1	8.00
2	0.00
3	4.98

IC004

1	0.00
2	0.00
3	0.00
4	3.15
5	3.15

IC005

1	4.98
2	3.35
3	0.00
4	3.35

IC451

1	1.33
2	14.43
3	-12.51
4	-14.60
5	0.00
6	14.53
7	1.33

IC510

1	0.00
2	0.00
3	0.00
4	3.26
5	0.10
6	0.00
7	3.21
8	0.00
9	0.00
10	0.25
11	3.26
12	2.93
13	0.00
14	0.00
15	3.26
16	3.26

IC511

1	0.12
2	0.00
3	0.00
4	0.00
5	2.99
6	8.02
7	0.39
8	12.02

IC881

1	9.42
2	0.00
3	4.92

IC882

1	14.43
2	0.00
3	8.77

Integrated circuits voltages A-BOARD TNP2AH037

IC2701	
1	0.19
2	0.19
3	0.19
4	0.00
5	2.43
6	2.37
7	2.41
8	8.73

IC2201	
1	0.00
2	0.00
3	0.00
4	2.27
5	2.19
6	0.27
7	4.90
8	4.49
9	2.56
10	0.42
11	2.31
12	3.18
13	3.35
14	2.19
15	3.33
16	3.43
17	0.00
18	2.91
19	2.91
20	0.00
21	2.20
22	2.20
23	0.00
24	0.00

IC2301	
1	0.00
2	0.00
3	30.70
4	0.00
5	0.00
6	0.00
7	15.45
8	0.67
9	0.00
10	31.97
11	11.94
12	15.37

IC2331	
85	4.35
86	4.35
87	4.35
88	0.00
89	4.35
90	4.35
91	4.35
92	8.74

IC2451	
1	0.00
2	0.00
3	0.00
4	4.36
5	4.35
6	4.35
7	4.35
8	4.35
9	4.35
10	4.35
11	4.35
12	4.35
13	0.00
14	1.95
15	8.74
16	0.00
17	3.00
18	0.00
19	0.00
20	0.00
21	0.00
22	0.00
23	0.00
24	0.00
25	0.00
26	4.36
27	4.36
28	4.36
29	4.35
30	4.36
31	3.39
32	4.35

IC3001	
1	4.52
2	4.52
3	4.52
4	4.73
5	4.73
6	4.62
7	4.61
8	4.61
9	4.74
10	4.74
11	8.74
12	4.61
13	4.61
14	4.61
15	4.74
16	4.74
17	4.60
18	4.58
19	4.61
20	4.73
21	4.73
22	0.00
23	4.76
24	4.77
25	4.43
26	4.48
27	4.50
28	8.74
29	4.77
30	4.77
31	4.62
32	4.48
33	4.48
34	0.00
35	3.00
36	2.81

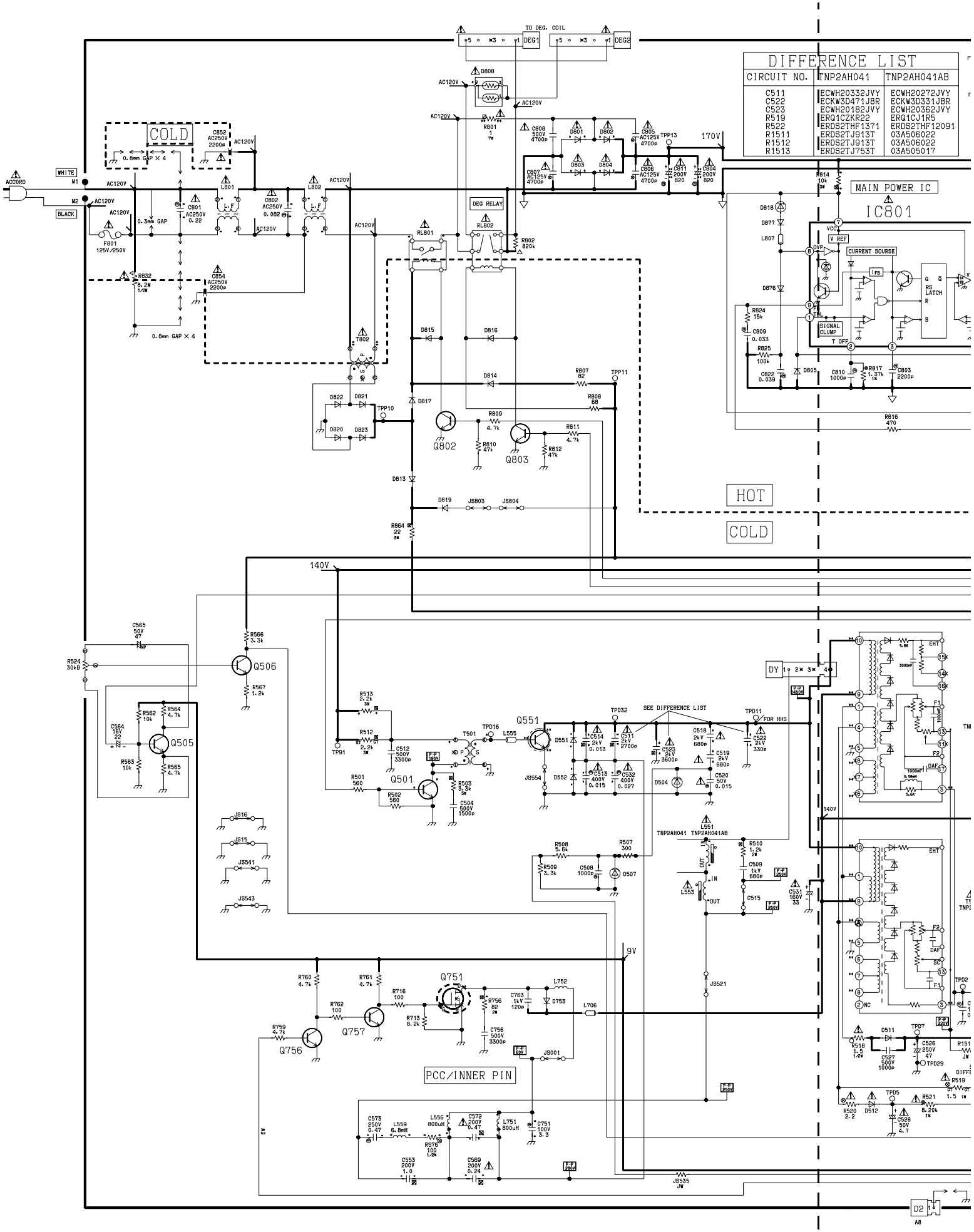
Transistor voltages A-BOARD TNP2AH037

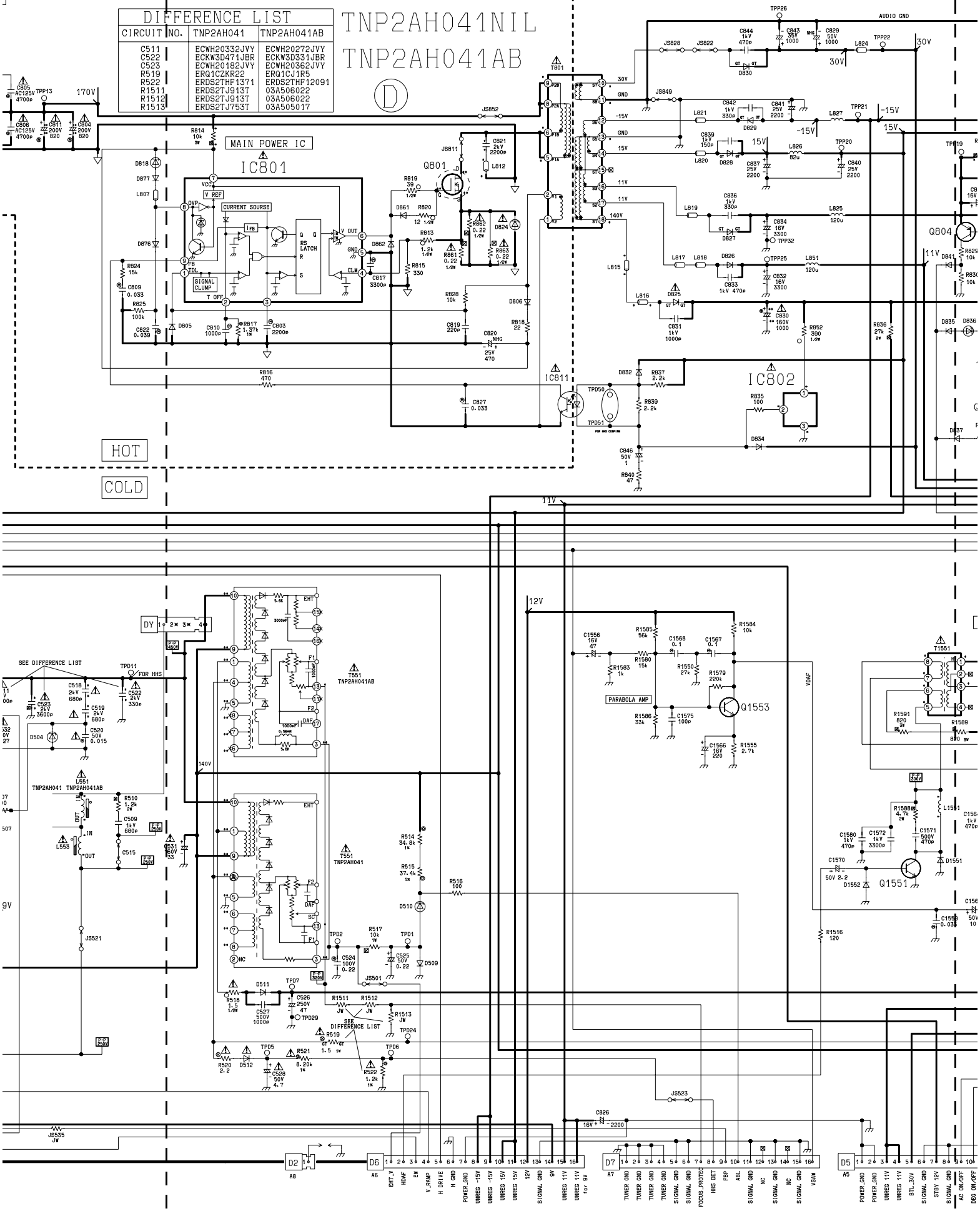
	Q009	Q019	Q021	Q022	Q023	Q024	Q302	Q401
B	0.39	0.37	3.06	0.68	0.84	1.34	4.67	2.68
C	2.49	2.71	0.00	0.00	0.00	4.91	3.40	0.00
E	0.00	0.00	3.69	1.34	1.50	1.30	5.34	3.35

	Q402	Q453	Q502	Q503	Q504	Q563	Q591	Q881
B	3.35	0.72	1.79	0.40	0.42	8.53	4.11	0.00
C	4.88	0.00	4.92	2.03	1.79	12.02	8.75	12.02
E	2.71	0.00	1.62	0.00	0.00	8.03	3.46	0.00

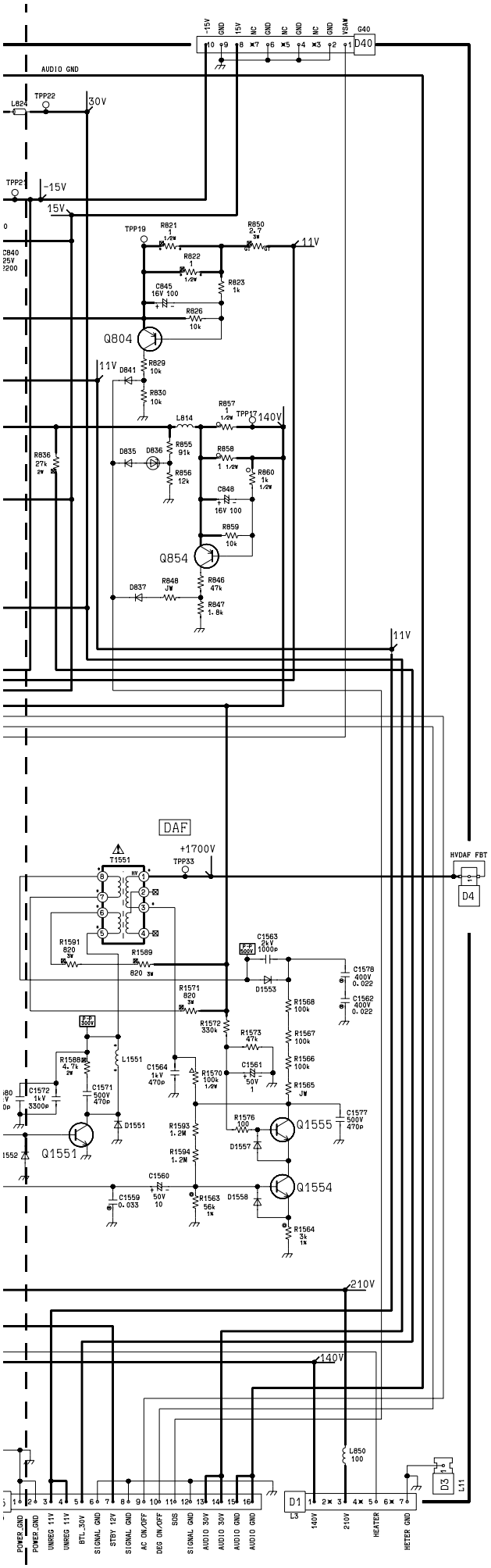
	Q882	Q883	Q901	Q2302	Q2304	Q2305	Q2331	Q2332
B	0.00	8.02	2.56	0.00	0.69	0.00	0.00	0.00
C	0.00	-0.19	4.67	3.13	0.00	11.94	8.10	0.00
E	-0.19	7.36	1.92	0.00	0.00	0.00	0.00	0.00

	Q2333	Q2334	Q2335	Q2336	Q2501	Q2502	Q2503	Q3050
B	0.00	0.00	8.00	0.64	4.47	4.48	4.62	4.45
C	0.00	0.00	0.00	0.00	8.00	8.00	8.00	8.74
E	0.00	0.00	7.35	0.00	3.83	3.83	3.97	3.80


DIFFERENCE LIST
CIRCUIT NO. | TNP2AH041 | TNP2AH041AB
C511 | ECWH20332JVY | ECWH20272JVY
C522 | ECKW3D471JBR | ECKW3D331JBR
C523 | ECWH20182JVY | ECWH20362JVY
R519 | ERQ1CZKR22 | ERQ1CJ1R5
R522 | ERDS2THF1371 | ERDS2THF12091
R1511 | ERDS2TJ913T | 03A506022
R1512 | ERDS2TJ913T | 03A506022
R1513 | ERDS2TJ753T | 03A505017
TO DEG. COIL
DEG1
DEG2
COLD
HOT
MAIN POWER IC
IC801
DEG RELAY
RL801
RL802
PCC/INNER PIN
SEE DIFFERENCE LIST
FOR HHS
TNP2AH041 TNP2AH041AB
170V
140V
9V
AC120V
WHITE
BLACK
ACCORD
0.8mm GAP × 4
0.3mm GAP
Q501
Q502
Q505
Q506
Q551
Q751
Q756
Q757
Q802
Q803


DIFFERENCE LIST
CIRCUIT NO. | TNP2AH041 | TNP2AH041AB
C511 | ECWH20332JVY | ECWH20272JVY
C522 | ECKW3D471JBR | ECKW3D331JBR
C523 | ECWH20182JVY | ECWH20362JVY
R519 | ERQ1CZKR22 | ERQ1CJ1R5
R522 | ERDS2THF1371 | ERDS2THF12091
R1511 | ERDS2TJ913T | 03A506022
R1512 | ERDS2TJ913T | 03A506022
R1513 | ERDS2TJ753T | 03A505017
TNP2AH041NIL
TNP2AH041AB
D
MAIN POWER IC
IC801
IC802
IC811
Q801
Q804
Q1553
Q1551
HOT
COLD
170V
30V
15V
-15V
11V
12V
140V
AUDIO GND
PARABOLA AMP
SEE DIFFERENCE LIST
FOR HHS
T551
TNP2AH041AB
TNP2AH041
L551
TNP2AH041AB
T1551
D2
D6
D7
D5

D-Board


-15V
GND
15V
NC
GND
NC
GND
NC
GND
VSAW
G40
D40
AUDIO GND
TPP22
30V
L824
TPP2
-15V
15V
TPP19
R821
1 1/2W
R850
2.7
3W
11V
R822
1 1/2W
R823
1k
C845
16V 100
R826
10k
Q804
R829
10k
D841
R830
10k
11V
R857
1 1/2W
TPP17
140V
L814
R855
91k
R858
1 1/2W
R860
1k 1/2W
D835
D836
R856
12k
C848
16V 100
R859
10k
Q854
R848
JW
D837
R846
47k
R847
1.8k
R636
27k
2W
11V
DAF
+1700V
TPP33
T1551
HVDAF FBT
D4
R1591
820
2W
R1589
820 3W
C1563
2kV
1000p
D1553
C1578
400V
0.022
C1562
400V
0.022
R1571
820
3W
R1568
100k
R1572
330k
R1573
47k
R1567
100k
R1566
100k
R1565
JW
R1588
4.7k
2W
L1551
C1564
1kV
470p
C1561
50V
1
R1570
100k
1/2W
C1572
1kV
3300p
C1571
500V
470p
D1551
Q1551
R1593
1.2M
R1594
1.2M
R1576
100
Q1555
D1557
C1577
500V
470p
C1560
50V
10
C1559
0.033
R1563
56k
1%
D1558
Q1554
R1564
3k
1%
210V
140V
L850
100
D3
L11
D1
L3
POWER_GND
POWER_GND
UNREG 11V
UNREG 11V
BTL_30V
SIGNAL GND
STBY 12V
SIGNAL GND
AC ON/OFF
DEG ON/OFF
SDS
SIGNAL GND
AUDIO 30V
AUDIO GND
AUDIO GND
140V
210V
HEATER
HETER GND

D-BOARD TNP2AH041

IC801↓	
1	1.46
2	0.37
3	0.17
4	0.00
5	0.00
6	5.10
7	15.38
8	1.04
9	5.91

IC802	
1	139.00
2	11.34
3	0.00

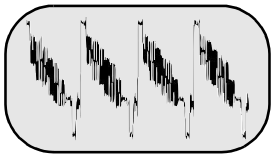
D-BOARD TNP2AH041

	Q501	Q505	Q506	Q551	Q756	Q757
B	0.35	4.34	3.51	-0.10	0.57	0.14
C	100.50	4.99	6.92	-35.30	0.17	4.42
E	0.00	3.73	2.87	0.00	0.00	0.00

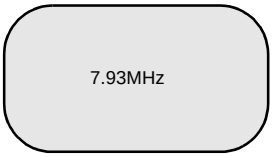
	Q802	Q803	Q804	Q854	Q1551	Q1553
B	0.71	0.00	15.11	140.00	-0.24	2.07
C	0.20	14.77	0.00	0.00	105.70	6.30
E	0.00	0.00	15.22	140.30	0.00	1.47

	Q1554	Q1555	Q751	Q801↓
B	3.05	14.93	0.00	0.00
C	14.37	139.60	25.58	40.40
E	2.48	14.37	4.37	4.98

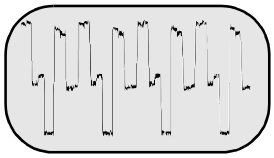
A-Board



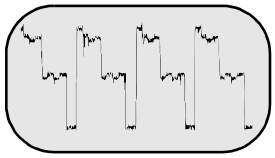
① **1.00V p-p**
IC001 PIN 17
(Main Video)



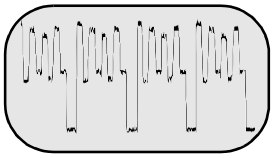
② X'TAL
IC101 PIN 50



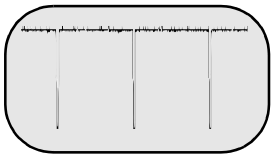
③ **0.34V p-p**
IC101 PIN 41
(R_OUT)



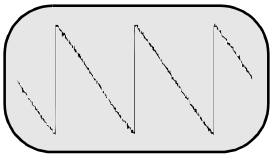
④ **0.35V p-p**
IC101 PIN 42 (G_OUT)



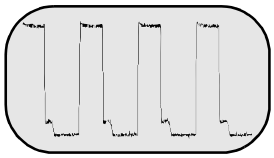
⑤ **0.40V p-p**
IC101 PIN 45 (B_OUT)



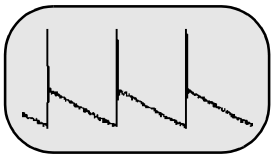
⑥ **3.04V p-p**
IC101 PIN 36
(FBP IN)



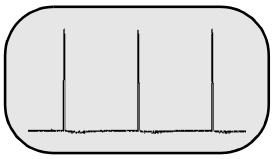
⑦ **1.56V p-p**
IC101 PIN 25
(V_NFB)



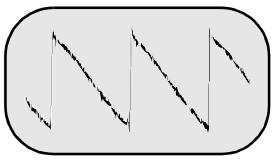
⑧ **1.58V p-p**
IC101 PIN 26
(H_OUT)



⑨ **54.4 Vp-p**
IC451 PIN 5 (V-DRIVE)



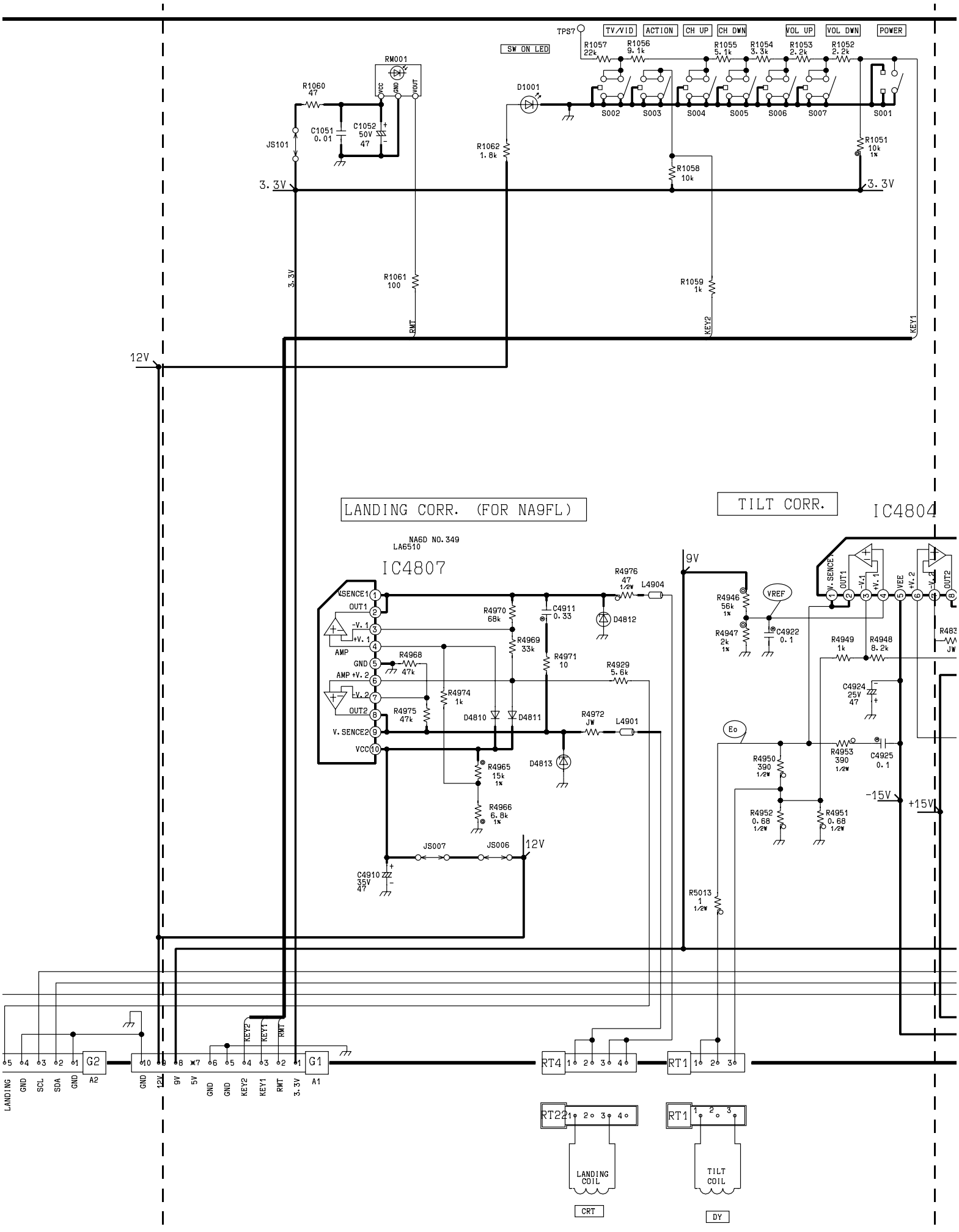
⑩ **29.0 Vp-p**
IC451 PIN 3 (VH)



⑪ **0.56 Vp-p**
IC451 PIN 1 (NECK PRO)

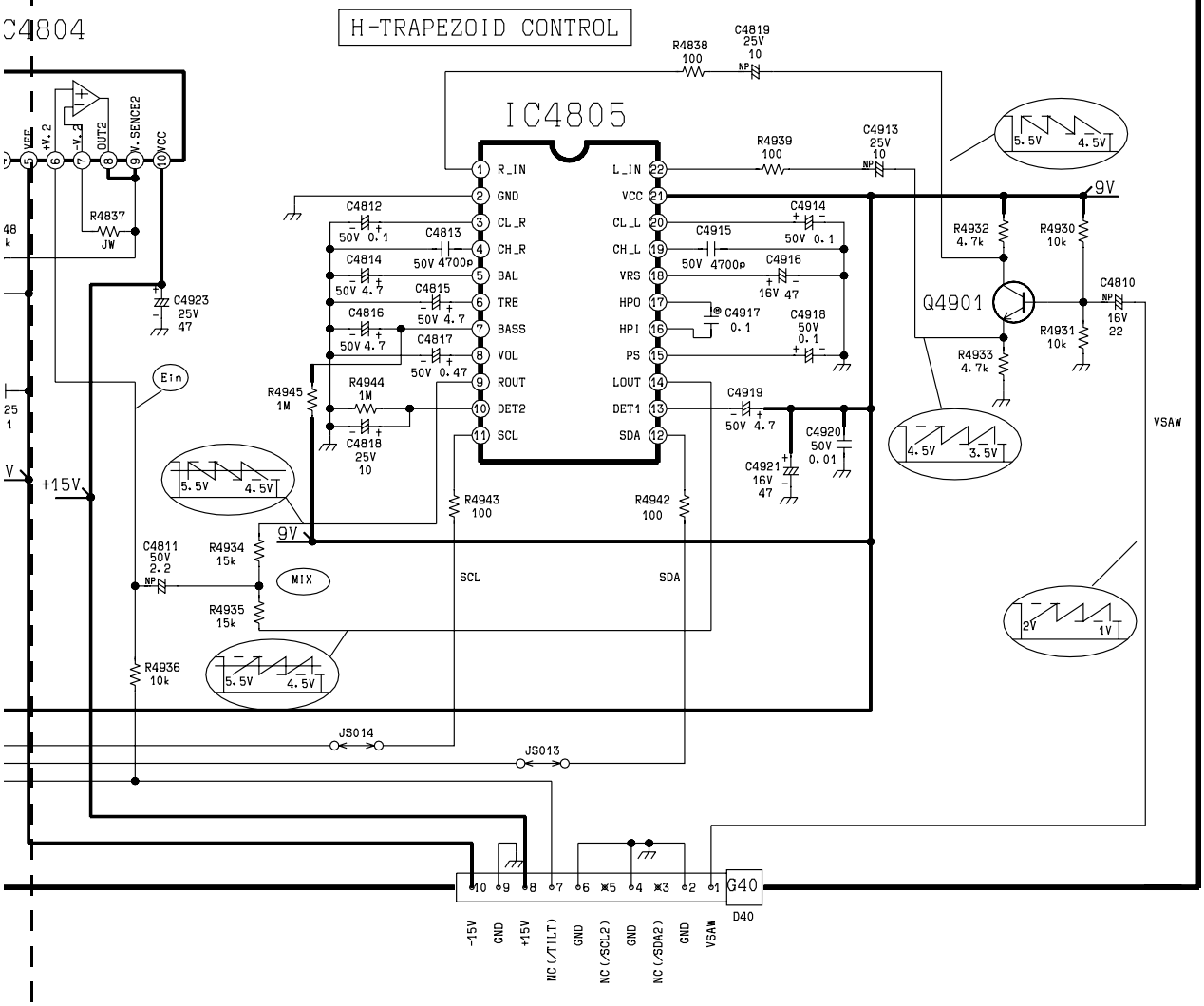
notes:

SP (L, R)
G4
TP001
TP002
JS004
JS005
L.F
L2336
L2337
JK3151
G
R
L
R2386
180
1W
JS002
JS001
R2385
180
1W
H/P Impedance
32ohm
S4_SW : S-VHS GND
D3160
D3159
L3001
56
JS3151
R3156
JW
JS3153
R3152
220k
JS3154
JS3155
R3154
220k
C3158
1500p
C3159
1500p
AV3V (/AV4V)
AV3L (/AV4L)
AV3R (/AV4R)
Y
C
V
L
R
D3111
D3110
D3113
D3112
D3115
D3114
D3117
D3116
D3119
D3118
A13
G5
AV4 V
AV4 GND
AV4 Y
AV4 C
D2320
D2321
R1060
47
C1051
0.01
JS101
3.3V
12V
G3
A3
L-OUT
(2)SP_GND
(2)SP_GND
R-OUT
GND
GND
R3(/R4)
V3(/V4)
L3(/L4)
Y3(/Y4)
G2
A2
C3(/C4)
S_3(/S_4
GND
TILT
HP MUTE
LANDING
GND
SCL
SDA
GND
G1
A1
GND
12V
9V
5V
GND
GND
KEY2
KEY1
RMT
3.3V


TPS7
TV/VID
ACTION
CH UP
CH DWN
VOL UP
VOL DWN
POWER
SW ON LED
RM001
VCC
GND
VOUT
D1001
R1057 22k
R1056 9.1k
R1055 5.1k
R1054 3.3k
R1053 2.2k
R1052 2.2k
S002
S003
S004
S005
S006
S007
S001
R1060 47
C1051 0.01
C1052 50V 47
JS101
R1062 1.8k
R1058 10k
R1051 10k 1%
3.3V
R1061 100
R1059 1k
RMT
KEY2
KEY1
12V
LANDING CORR. (FOR NA9FL)
TILT CORR.
IC4804
NA6D NO.349
LA6510
IC4807
VSENCE1
OUT1
-V.1
+V.1
AMP
GND
AMP +V.2
-V.2
OUT2
V.SENCE2
VCC
R4976 47 1/2W
L4904
R4970 68k
C4911 0.33
D4812
R4969 33k
R4971 10
R4968 47k
R4929 5.6k
R4974 1k
R4975 47k
D4810
D4811
R4972 JW
L4901
D4813
R4965 15k 1%
R4966 6.8k 1%
JS007
JS006
C4910 35V 47
9V
R4946 56k 1%
R4947 2k 1%
VREF
C4922 0.1
V.SENCE
OUT1
-V.1
+V.1
VEE
+V.2
-V.2
OUT2
R4949 1k
R4948 8.2k
C4924 25V 47
Eo
R4953 390 1/2W
C4925 0.1
R4950 390 1/2W
R4952 0.68 1/2W
R4951 0.68 1/2W
-15V
+15V
R5013 1 1/2W
G2
A2
G1
A1
LANDING
GND
SCL
SDA
GND
GND
12V
9V
5V
GND
GND
KEY2
KEY1
RMT
3.3V
RT4
RT1
RT22
RT1
LANDING COIL
TILT COIL
CRT
DY

G-Board

TNP2AA113 G


H-TRAPEZOID CONTROL
IC4805
R_IN
GND
CL_R
CH_R
BAL
TRE
BASS
VOL
ROUT
DET2
SCL
L_IN
VCC
CL_L
CH_L
VRS
HPO
HPI
PS
LOUT
DET1
SDA
R4838 100
C4819 25V 10 NP
R4939 100
C4913 25V 10 NP
C4812 50V 0.1
C4813 50V 4700p
C4814 50V 4.7
C4815 50V 4.7
C4816 50V 4.7
C4817 50V 0.47
C4914 50V 0.1
C4915 50V 4700p
C4916 16V 47
C4917 0.1
C4918 50V 0.1
C4919 50V 4.7
C4920 50V 0.01
C4921 16V 47
R4944 1M
R4945 1M
C4818 25V 10
R4943 100
R4942 100
R4837 JW
C4923 25V 47
R4932 4.7k
R4930 10k
R4931 10k
R4933 4.7k
Q4901
C4810 NP 16V 22
C4811 50V 2.2 NP
R4934 15k
R4935 15k
R4936 10k
MIX
Ein
+15V
9V
VSAW
SCL
SDA
5.5V
4.5V
3.5V
2V
1V
JS014
JS013
G40
D40
-15V
GND
+15V
NC (/TILT)
GND
NC (/SCL2)
GND
NC (/SDA2)
GND
VSAW

G-BOARD TNP2AA113

IC4804	
1	2.56
2	2.56
3	0.29
4	0.29
5	-14.97
6	2.71
7	2.72
8	2.72
9	2.72
10	14.80

IC4805	
1	4.33
2	0.00
3	4.38
4	4.36
5	4.38
6	3.33
7	4.83
8	5.40
9	4.46
10	1.53
11	3.00
12	2.85
13	5.66
14	4.44
15	4.34
16	4.29
17	4.38
18	4.34
19	4.36
20	4.37
21	8.76
22	4.33

IC4807	
1	5.68
2	5.68
3	3.72
4	3.74
5	0.00
6	2.81
7	2.80
8	5.65
9	5.64
10	12.02

	Q4901
B	4.35
C	5.08
E	3.72

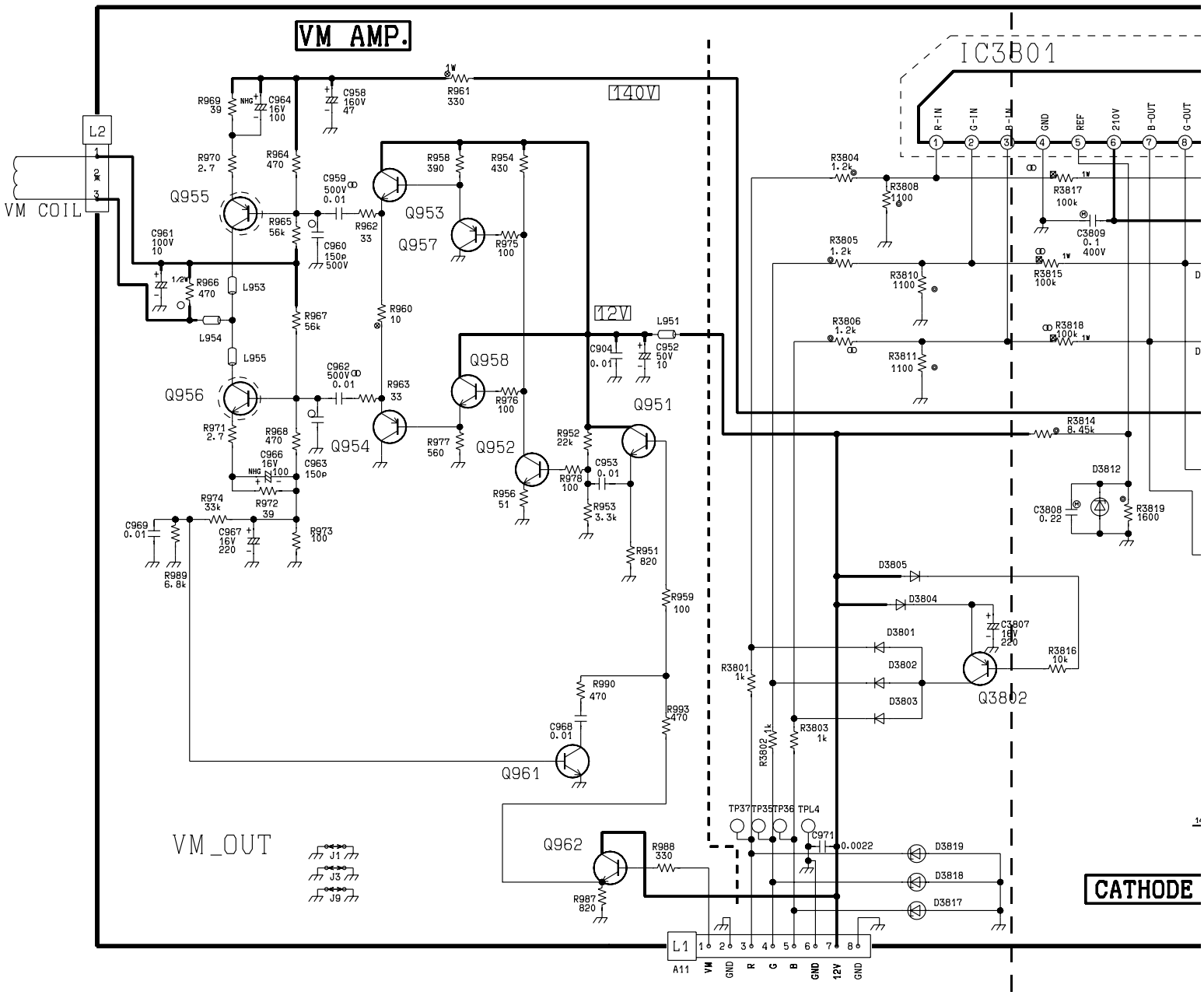
L-BOARD TNPA1673

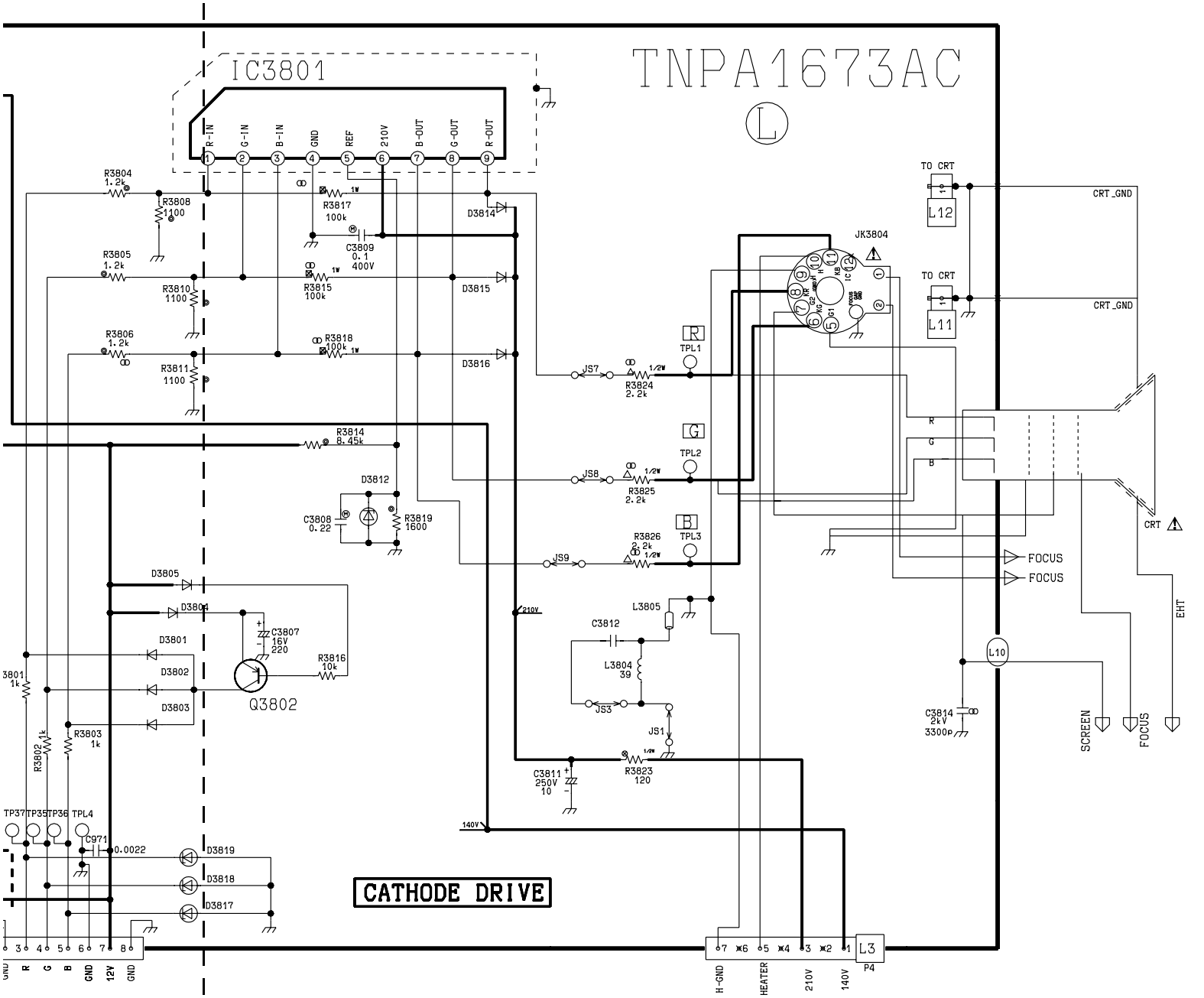
IC3801	
1	1.89
2	1.89
3	1.89
4	0.00
5	1.91
6	216.30
7	154.90
8	155.60
9	153.10

	Q951	Q952	Q953	Q954
B	2.75	1.38	6.77	5.46
C	12.01	6.11	12.01	0.00
E	2.12	0.71	6.13	6.09

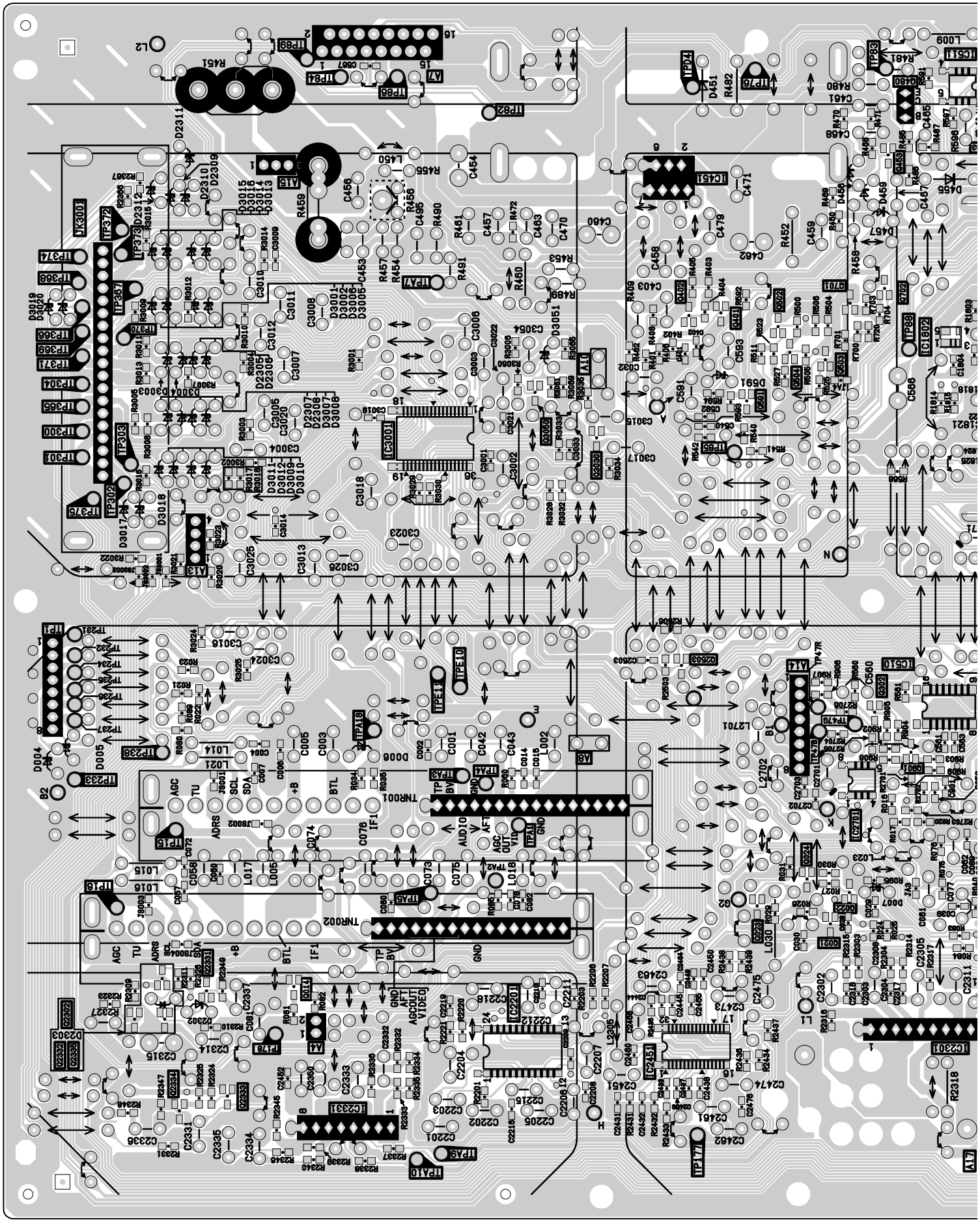
	Q955	Q956	Q957	Q958
B	138.20	0.88	6.11	2.65
C	70.10	70.30	0.00	11.86
E	138.70	0.36	6.77	2.01

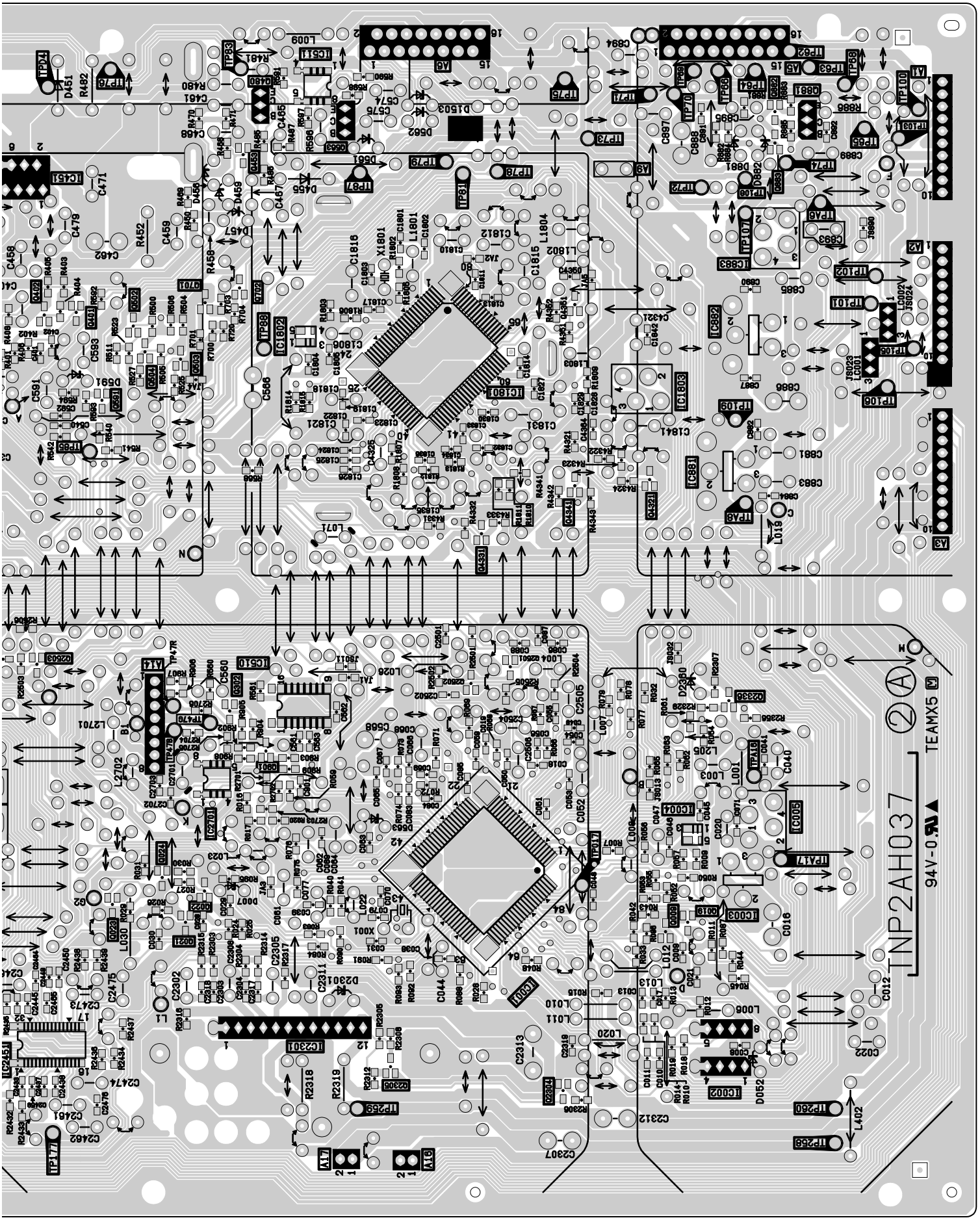
	Q961	Q962	Q3802
B	0.00	3.40	12.00
C	0.25	12.01	-0.18
E	0.00	2.75	11.92

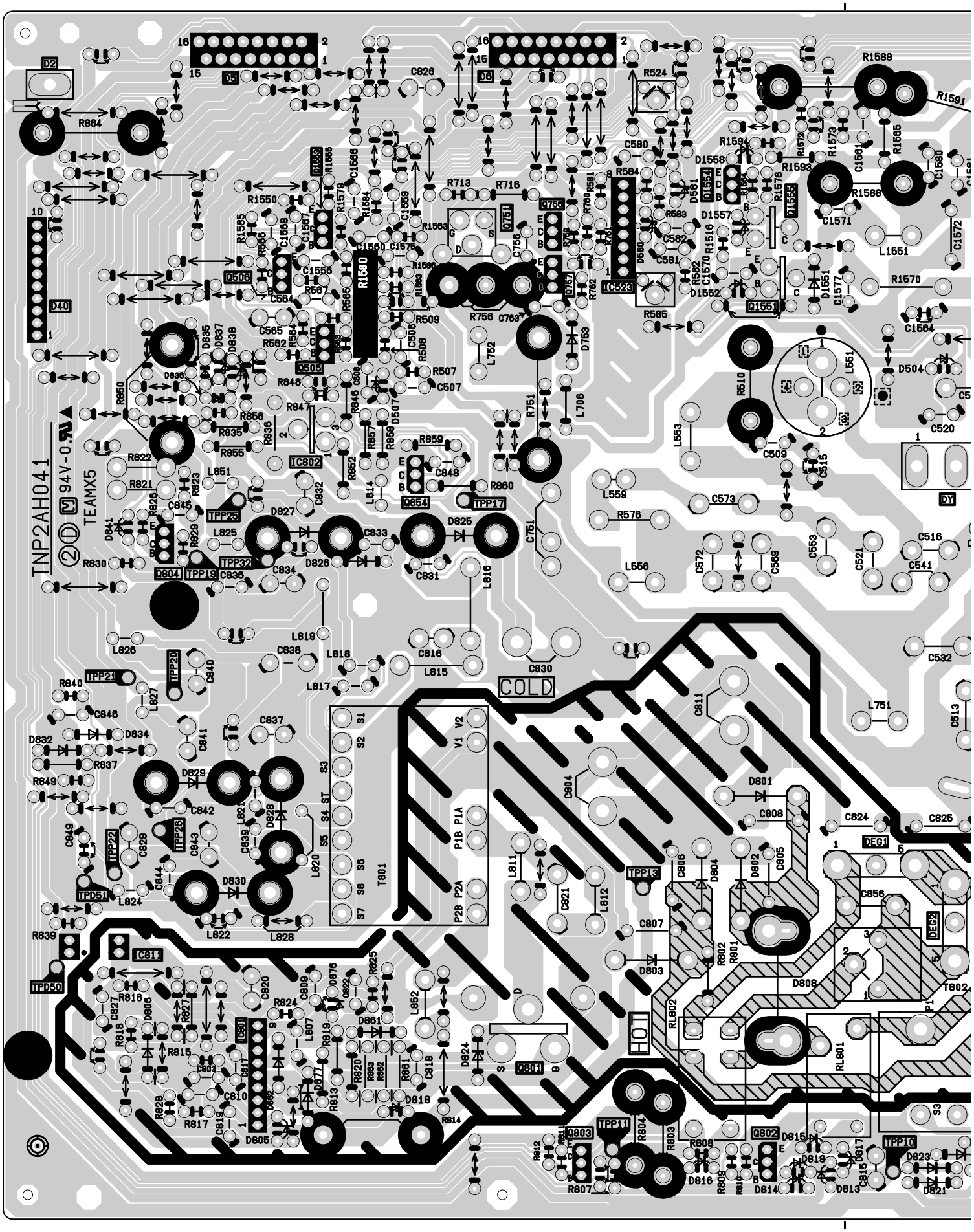

VM AMP.
IC3B01
140V
12V
VM COIL
VM_OUT
CATHODE
L2
L1
A11
Q955
Q953
Q957
Q956
Q954
Q958
Q952
Q951
Q961
Q962
Q3802
R-IN
G-IN
B-IN
GND
REF
210V
B-OUT
G-OUT
VM
GND
R
G
B
GND
12V
GND


TNPA1673AC
L
IC3801
R-IN
G-IN
B-IN
GND
REF
210V
B-OUT
G-OUT
R-OUT
R3804 1.2k
R3808 1100
R3817 100k
C3809 0.1 400V
D3814
R3805 1.2k
R3810 1100
R3815 100k
D3815
R3806 1.2k
R3811 1100
R3818 100k
D3816
R3814 8.45k
D3812
C3808 0.22
R3819 1600
D3805
D3804
D3801
D3802
D3803
C3807 16V 220
R3816 10k
Q3802
R3803 1k
R3802 1k
3801 1k
TP37 TP35 TP36 TPL4
C971 0.0022
D3819
D3818
D3817
CATHODE DRIVE
GND R G B GND 12V GND
TO CRT
L12
CRT_GND
JK3804
TO CRT
L11
CRT_GND
TPL1
JS7
R3824 2.2k
TPL2
JS8
R3825 2.2k
TPL3
JS9
R3826 2.2k
R G B
CRT
FOCUS
FOCUS
EHT
210V
L3805
C3812
L3804 39
JS3
JS1
R3823 120
C3811 250V 10
140V
L10
C3814 2kV 3300P
SCREEN
FOCUS
H-GND HEATER 210V 140V
L3
P4

L-Board




TNP2AH037
TEAMX5
94V-0


TNP2AH041
94V-0
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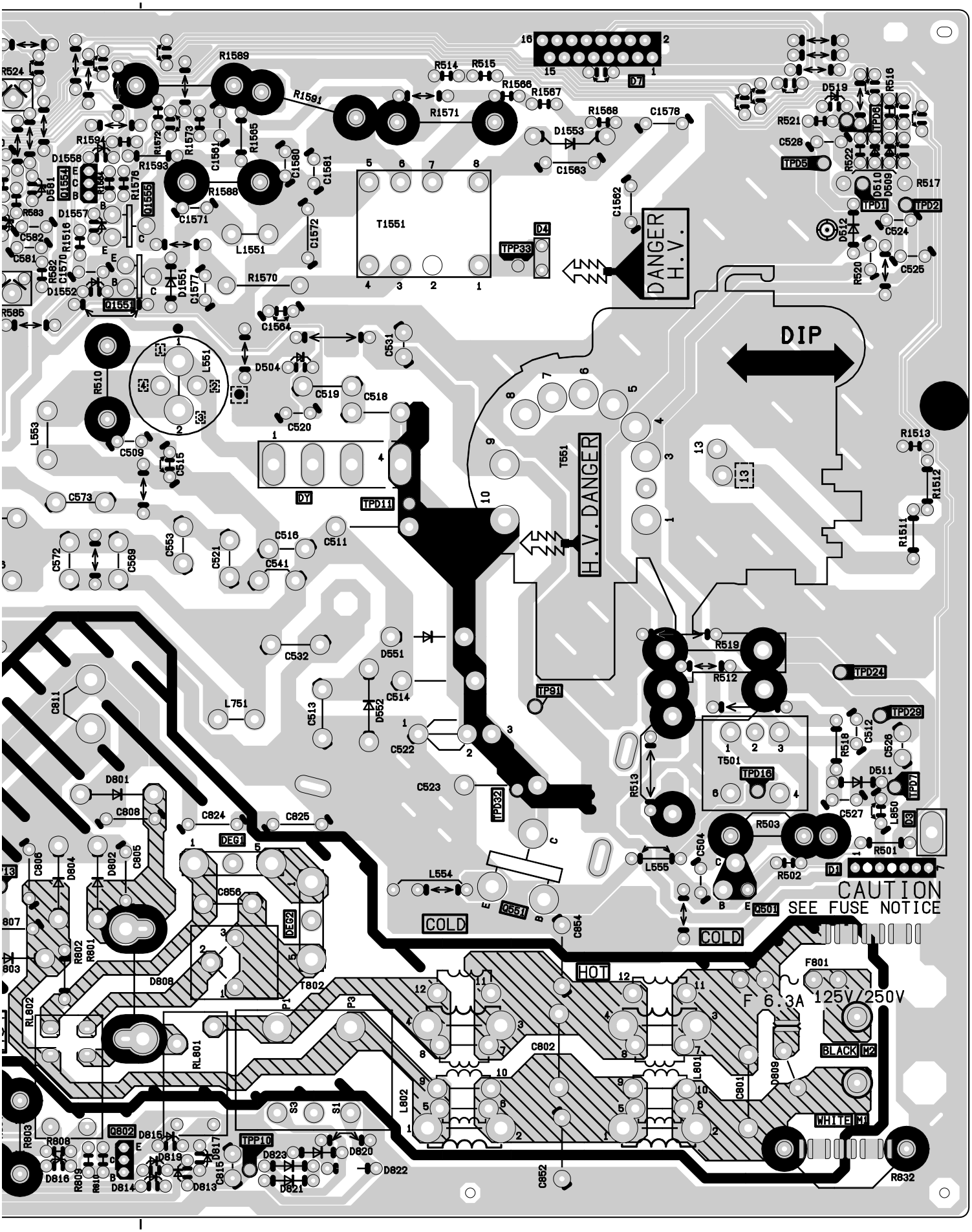
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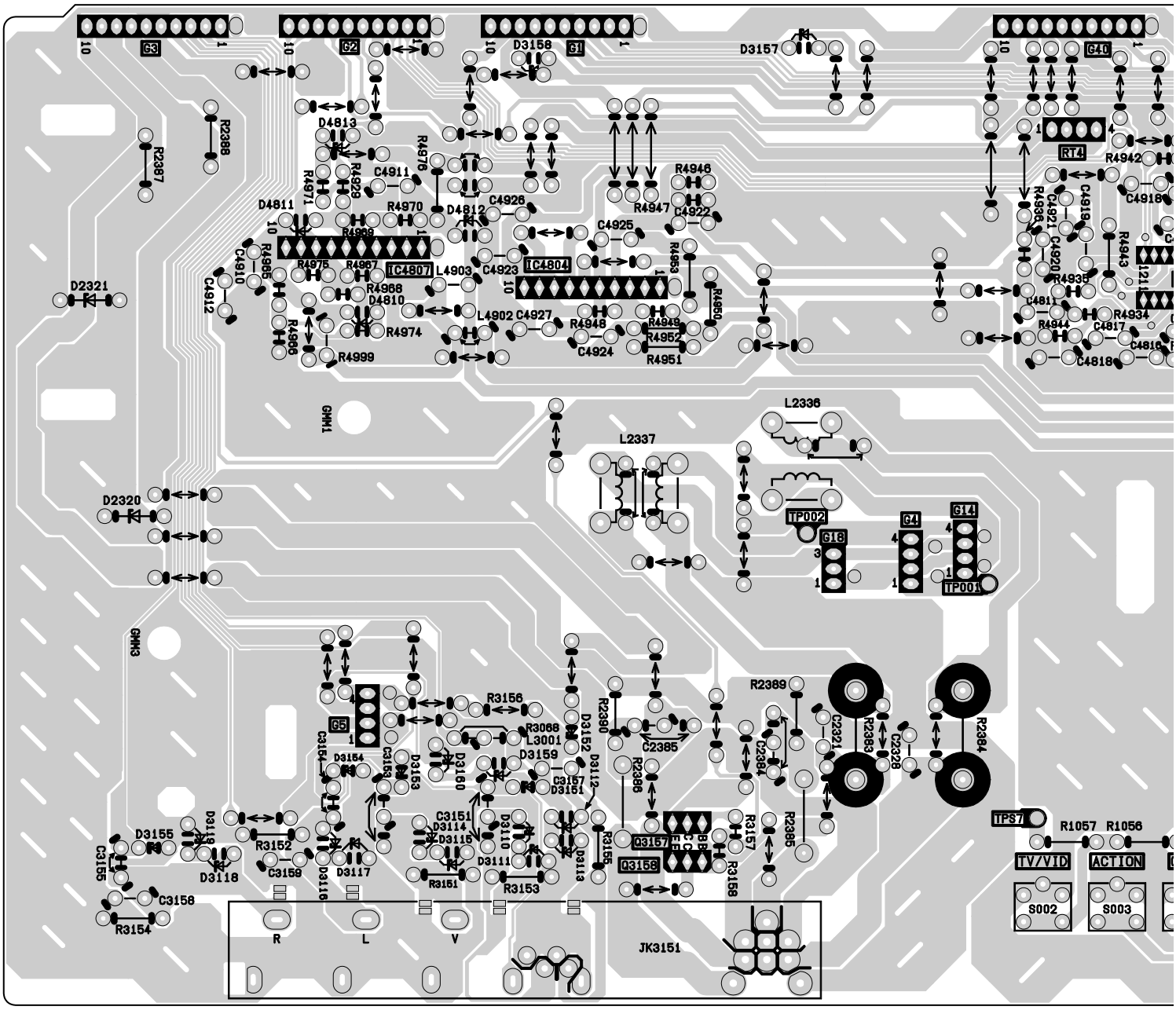
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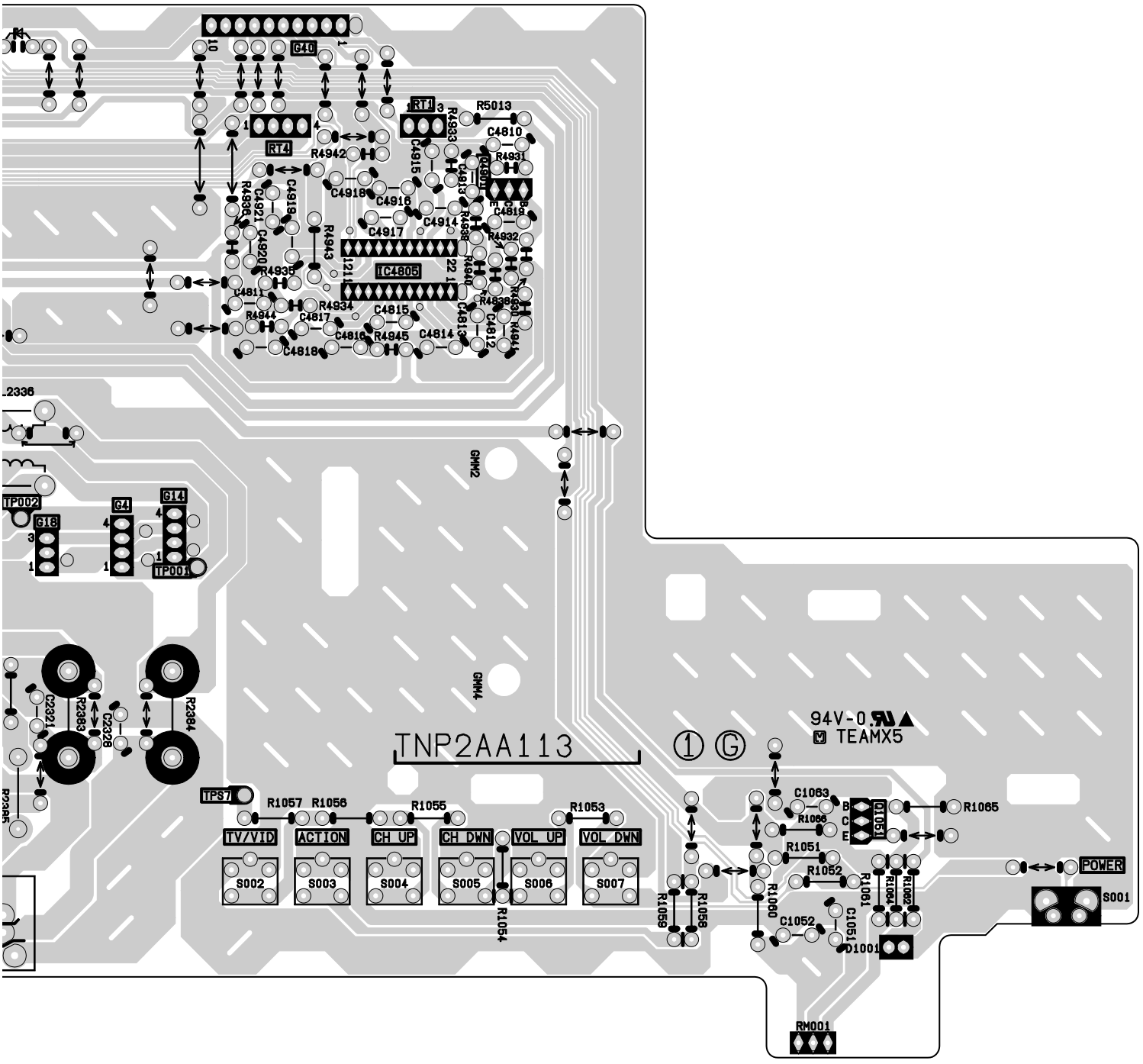
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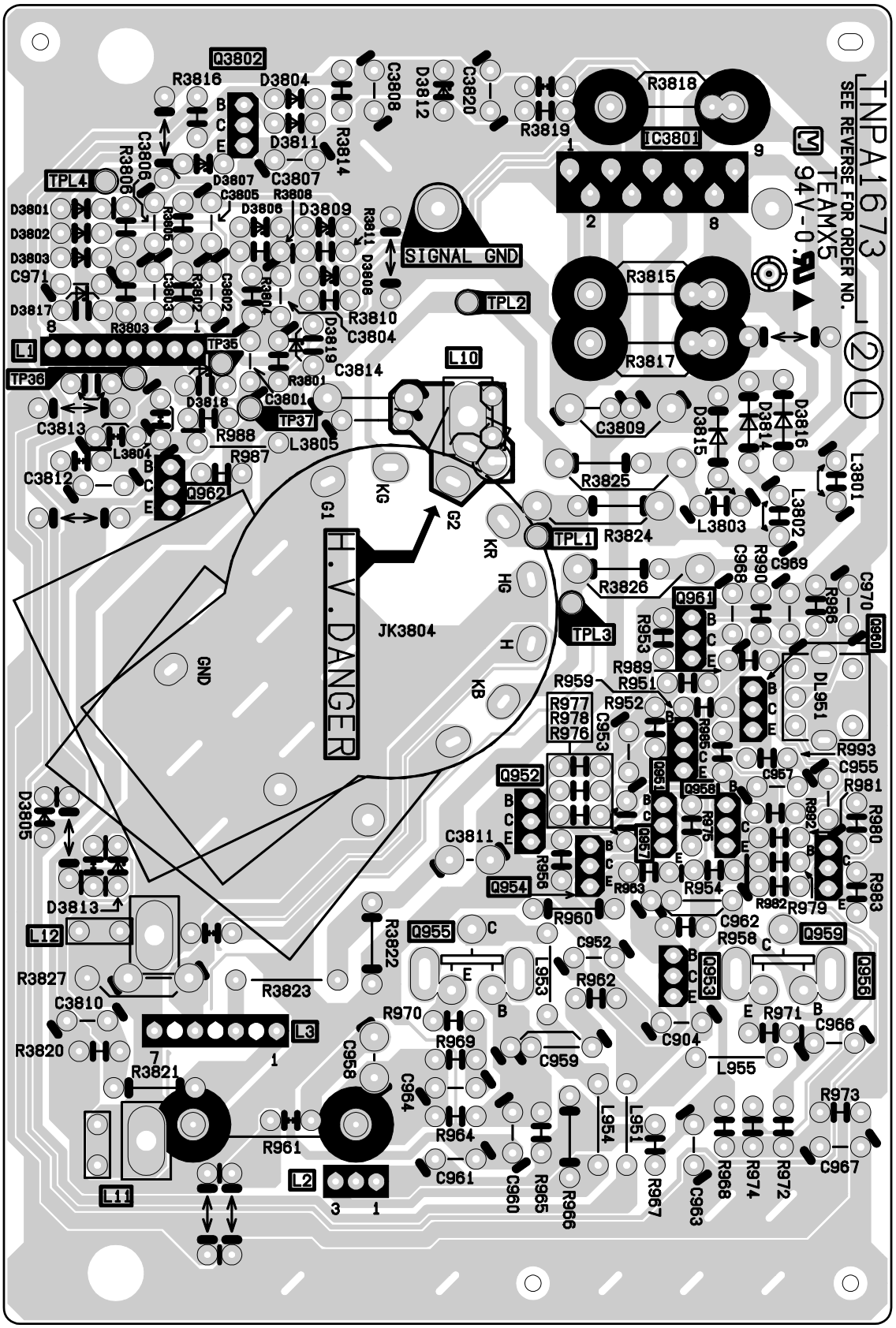
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SEE REVERSE FOR ORDER NO.
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